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Sibling Self-Management: Programming for Generalization to Improve Interactions between Typical Siblings and Children with Autism Spectrum Disorders

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SIBLING SELF MANAGEMENT: PROGRAMMING FOR GENERALIZATION TO IMPROVE INTERACTIONS BETWEEN TYPICAL SIBLINGS AND CHILDREN WITH AUTISM SPECTRUM DISORDERS

by

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Abstract

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by

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Interactions between children with Autism Spectrum Disorders (ASD) and their typically developing siblings are often of lower quality compared to their typical peers. Teaching behavior change strategies to typical siblings and their siblings with ASD can improve their interactions, but there is limited empirical evidence that it results in generalized improvements. One method to program for generalization is to teach learners to monitor their engagement in behavior change tactics (i.e., self-management). A multiple baseline probe design across typical sibling-sibling with ASD dyads was used to demonstrate a functional relationship between behavioral skills training with typical siblings and their engagement in self-management of a social skills curriculum. Results indicated that typical siblings learned to self-manage a social skills curriculum, which generalized across novel settings and over time. Comparisons of social-communicative responses by typical sibling-sibling with ASD dyads to their typical peers were variable across participants, but did provide some support for the social validity of the intervention outcomes. These results provide further evidence to support the use of self-management when explicitly programming for generalization, which continues to be a key consideration when including typical siblings in interventions with their siblings with ASD.

Alternate programming strategies to further positively impact the interactions between the siblings are discussed.

Acknowledgments

To my husband, Joe
Thank you for your support and patience. Thank you for promising Betty that I'd finish no matter what happened.

To my mother, Betty
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SIBLING SELF MANAGEMENT: PROGRAMMING FOR GENERALIZATION TO IMPROVE INTERACTIONS BETWEEN TYPICAL SIBLINGS AND CHILDREN WITH AUTISM SPECTRUM DISORDERS

by

LAUREN KRYZAK

> Sibling relationships are emotionally powerful and critically important not only in childhood but over the course of a lifetime. As children, siblings form a child's first peer group, and they typically spend more time with each other than with anyone else. Children learn social skills, particularly in sharing and managing conflict, from negotiating with brothers and sisters. Sibling relationships can provide a significant source of continuity throughout a child's lifetime and are likely to be the longest relationships that most people experience (US Department of Health and Human Services, 2006, Sibling Issues in Foster Care and Adoption, page 4).

The relationship between siblings, regardless of the presence of a disability, is a significant one. Siblings are often the first peers to whom a child is exposed and, as a result, are each others' first models of interpersonal characteristics (Miller & Cantwell, 1976; Orsmond & Seltzer, 2007b). Siblings provide countless learning opportunities for social interactions in the natural environment that then generalize to other peers (Miller & Cantwell, 1976). The sibling relationship is often the longest lasting between two individuals. Siblings provide friendship and support throughout each others' lives, well into adulthood. When one sibling has an Autism Spectrum Disorder (ASD), the relationship becomes challenging.

Interactions between typically developing siblings and children with ASD are different from those between two typical siblings, a typical sibling with his/her peer, or a typical sibling with his/her sibling with Down syndrome. They involve less intimacy and nurturance, as well as fewer positive responses, prosocial behaviors, and social initiations (e.g., James & Egel, 1986;

Kaminsky & Dewey, 2001). Siblings often spend less time and have lower quality interactions when one has an ASD, resulting in fewer social learning opportunities for both children.

To further complicate the relationship, typical siblings may also experience emotional or behavioral maladjustment. Findings of research on their maladjustment is quite varied with a recent review by Meadan, Stoner, and Angell (2010) yielding mixed results regarding typical siblings' behavior problems, depression, loneliness, and conflict with the sibling with ASD. Other research results indicate some siblings of children with ASD may experience a loss of parental attention, feelings of guilt/shame, difficulty dealing with others' reactions, and taking on the role of "caregiver" from an early age (e.g., Rodrigue, Geffken, & Morgan, 1993). Collectively, research findings suggest that at least a subset of typical siblings may benefit from professional services, such as behavioral training.

Behavioral training involves typical siblings in a variety of intervention procedures, including receiving direct instruction themselves, serving as social/play partners for their siblings with ASD, and being involved as novel partners for tests of generalization. Methods of training siblings may involve direct one-to-one in-vivo training by an experimenter/parent, viewing training videos, and/or participating in group lessons (Cash & Evans, 1975; Celiberti & Harris, 1993; Craft, Lakin, Oppliger, Clancy, & Vanderlinden, 1990; Lavigueur, 1976). Including typical siblings in behavioral training with their siblings with ASD has potential benefits for both children. Involvement in behavioral training is correlated with decreased depression and increased coping skills (Hastings & Beck, 2004); both of which are areas of concern for typical siblings. Learning ways to successfully interact with a sibling with ASD may help decrease frustration and stress experienced by typical siblings. Children with ASD may learn social responses with their trained siblings, as peer-trained social and language skills are more robust,

generalizable, and easily learned than those taught by adults (Kamps et al., 2002). The majority of training studies demonstrated that typical siblings successfully acquired behavioral strategies to use to then teach their siblings with ASD a specific skill.

The goal of sibling interventions, however, is something broader than the acquisition of a limited set of skills by either child. The superseding goal should be to improve the relationship so that both children receive the life-long benefits of having a sibling. Interventions should explicitly target functional changes in the siblings' relationship and simultaneously consider whether those relationship changes generalize. First, changes in the typical sibling-sibling with ASD relationship associated with behavioral interventions will be considered and then those relationship changes in the context of various generalization parameters will be discussed.

Developing a universally-accepted definition of what constitutes a positive sibling relationship is difficult. In general, the relationship between two individuals is complex, multi-faceted, and there are many factors which collectively contribute to its quality. Operational definitions of relationship have included the amount of time siblings spend together (e.g., McLinden, Miller, & Deprey, 1991), frequency of negative interactions (e.g., McHale & Gamble, 1989), care giving responsibilities (e.g., McHale & Gamble, 1989), valence of statements about their sibling (e.g., Lobato, 1985), and reciprocal interactions (e.g., James & Egel, 1986). Compared to the other examples, reciprocal interactions is a direct measure of behavior by both children in the context of each other's responses. A change in behavior by either child alone does not necessarily indicate that there are corresponding changes in the siblings' interactions or, in turn, their long-term relationship.

Behavioral training studies with typical siblings of children with ASD often do not focus on interactions between siblings as a dependent measure (Kryzak & Jones, 2014). Of those

studies that did, the most consistent measure of "interactions" was the proportion of time the siblings interacted. Authors defined "interact" differently and, correspondingly, found varied results. For example, Baker (2000) found positive changes in the percentage of intervals during which typical siblings and siblings with ASD engaged in social play (i.e., interacted) after teaching the siblings to play a game together. In contrast, Oppenheim-Leaf, Leaf, Dozier, Sheldon, and Sherman (2012) taught three typical siblings to: provide play instructions, ask to share, and invite their siblings with ASD to play. They then found only 1 out of the 3 sibling pairs increased the proportion of time they engaged in cooperative play (i.e., interacted). These studies suggest that it is possible to objectively measure siblings' interactions by looking at the behavior of both social partners simultaneously, but the operational definitions of "interact" need to be carefully considered.

Of the behavioral training studies that examined changes in the typical sibling-sibling with ASD interactions, few have measured generality of those changes. Generality refers to response change without direct teaching, occurring in various environments, that is durable over time (Baer, Wolf, & Risley, 1968). Characteristics of the sibling relationship, such as its longevity, the multitude of environments in which siblings interact, and response variability by each sibling, require that siblings learn skills that persist across all parameters of generality. Some studies that measured sibling interactions while simultaneously considering maintenance and generalization found improvements. For example, Baker (2000) found that improvements in sibling interactions (social play) generalized to the children's schools and home during 1- and 3-month maintenance probes. Others did not find consistent improvements, such as Charlop and Milstein (1989), who measured the post-training generalization of learned conversation scripts by children with ASD across novel partners (i.e., siblings) and settings. Some studies separately

considered generalization and maintenance of social behavior between typical siblings and their siblings with ASD and also did not find consistent improvements. For example, Tsao and Odom (2006) trained four typical siblings to engage in a social skills program, based on several peer-mediated interventions, including Stay-Play-Talk (SPT; English, Shafer, Goldstein, & Kaczmarek, 1997), with their siblings with ASD. Two typical siblings and one sibling with ASD demonstrated improved social behavior in novel setting generalization probes during intervention. One typical sibling and two siblings with ASD maintained improvements across 1-3 week probes in the intervention setting. These collective results suggest that further attention needs to be paid to changes in siblings' interactions in novel settings over time to ensure that intervention impacts the sibling relationship and that those changes maintain.

Best practice recommendations for increasing the likelihood of generalization are to proactively program for it (Stokes & Baer, 1977). One empirically-supported method to affect generality is self-management (Sanders & Glynn, 1981). Self-management is when behavior change tactics are implemented and monitored by the individual, rather than by an outside observer, to control their own behavior change (Cooper, Heron, & Heward, 2007). For example, Sanders and Glynn (1981) taught parents to implement intervention strategies (i.e., use prompts, planned ignoring, and consequences) to decrease their children's disruptive behavior (e.g., non-compliance, aggression) and increase appropriate behavior. Training initially consisted of instructions and feedback, but, after 2 weeks, a self-management lesson was added. The initial instruction and feedback condition resulted in accurate implementation of intervention by all parents and reductions in all children's challenging behavior in the home setting, but inconsistent generalization outside the home for both parents and children. Once the self-management

condition was introduced, all parents and children demonstrated generalization across settings that maintained over 3 months.

Advantages of self-management include removing the onus of implementation from an interventionist, increasing the likelihood of generality because the controlling stimuli are always present in the learner's environment, and maintaining responding in the absence of the interventionist (Cooper et al., 2007). These are particularly relevant advantages for sibling interventions. First, typical sibling-sibling with ASD dyads have many opportunities to "unlearn" target responses since they interact in the absence of the interventionist. Siblings have opportunities to engage in the target responses without receiving reinforcement and simultaneously not engage in the target responses without any consequence. Second, if the interventionist becomes the controlling stimuli to set the event for the target responses or controls the mediation of reinforcement, rather than the siblings themselves, then the target responses will likely not maintain when the interventionist is not present. These points are supported by the results of Sanders and Glynn (1981) who did not find changes in parents' responses to their children's challenging behavior in generalization settings until the self-management condition was introduced. Self-management may also be a particularly good strategy to use when addressing social interactions because interventionists do not need to insert themselves into the natural environment. The author could not identify any published research that has considered the effects of having a social partner (e.g., sibling, peer) monitor their social interactions with a child with ASD.

The purpose of the current study was to evaluate the effectiveness of teaching self-management of a social skills curriculum to typical siblings of children with ASD on the generalized interactions between siblings. The author used the Stay-Play-Talk curriculum (SPT;

English et al., 1997). The SPT curriculum progressively shapes interactions between peers by teaching them to a) stay within proximity of their peer, b) engage in cooperative play with their peer, and c) initiate and respond to verbalizations by their peer. Recall that Tsao and Odom (2006) found teaching social skills lessons, including SPT, increased social behaviors between some typical siblings and their siblings with ASD, but did not result in consistent improvements across novel settings or 1-3 week maintenance probes. By teaching the typical siblings to self-manage SPT responses, it is possible that gains in social behaviors between siblings would generalize and maintain. The present study addressed the following research questions:

1) Does behavioral skills training result in improvements in typical siblings' self-management (goal setting, monitoring, and recruiting reinforcement) of the SPT curriculum (English et al., 1997)? Because self-management responses have been acquired by other populations (e.g., children with ASD) and research supports the acquisition of SPT responses by typical siblings (Tsao & Odom, 2006), the author hypothesized that the typical siblings would acquire these responses.

2) Do improvements in self-management and SPT responses generalize across settings and maintain across time? The author hypothesized that siblings would show generalization of SPT and self-management across two novel settings and through a 14 week maintenance period.

3) Are improvements in self-management and SPT responses associated with improvements in sibling interactions? The author hypothesized that all typical sibling-sibling with ASD dyads would show improvements in social-communicative responses, which would also be demonstrated across novel settings and 14-week maintenance sessions.

Method

Participants

Four typically developing siblings and their four siblings with ASD were recruited and all completed the current study (Table 1). Inclusion criteria were 1) parent report of an ASD diagnosis (made by practitioners not associated with this study) for one child and absence of ASD for a second child, 2) author administration of the Autism Diagnostic Observation Schedule-Generic (ADOS-G; Lord, Rutter, DiLavore, & Risi, 1999) that confirmed scores within the *autism spectrum* range for child with a parent-reported ASD diagnosis, 3) average performance on the Stanford-Binet Intelligence Scales – Fifth edition (SB5; Roid, 2003a) for the typical siblings, and 4) non-clinical scores on the parent-completed Child Behavior Checklist (CBC; Achenbach & Rescorla, 2001) for the typical siblings. Prior to enrollment in the study, a parent completed the CBC for each child. Sibling dyads were excluded if 1) either child received a score in the clinical range (i.e., greater than a T score of 64) on the Aggressive Behavior subscale of the CBC, 2) the typical sibling scored in the clinical range on any of the Syndrome subscales (e.g., Thought Problems, Attention Problems), or 3) the typical sibling scored less than 50^{th} percentile on Full Scale of the author-administered SB5. Since the CBC is not standardized for children with ASD, if a sibling with ASD received clinical scores on the Syndrome subscales, it did not result in exclusion. No sibling dyads were excluded from participation.

Four typical sibling dyads participated to provide a comparison to interactions between typical sibling-sibling with ASD dyads (to be described shortly) for social validity purposes. Typical sibling dyads were recruited by word of mouth. To be included neither sibling could have or have had a diagnosis of ASD, as per parent report, and were of comparable age and/or gender to the siblings with ASD and their typical siblings. Typical sibling dyads included 14 and

7 year old boys, 9 and 6 year old boys, a 13 year old girl and her 9 year old brother, and a 13 year old girl with her 6 year old brother.

Materials

Materials included the ADOS-G (Lord et al., 1999), SB5 (Roid, 2003a), and CBC (Achenbach & Rescorla, 2001). The author created a modified Stay-Play-Talk curriculum (SPT; English et al., 1997) (Appendix A) and visual prompts. The author identified rewards by having parents complete the Reinforcement Assessment for Individuals with Severe Disabilities (RAISD; Fisher, Piazza, Bowman, & Amari, 1996) for siblings with ASD and typical siblings completed an open-ended questionnaire created by the author for themselves. Rewards identified included money, iTunes® gift cards, stuffed animals, tangibles which provided audio, visual, and/or tactile input, and children's toys, such as Flashlight Friends™ or Rainbow loom®. The author used data sheets to track progress of typical sibling's self-management and engagement in SPT responses (Appendix B). Typical siblings used alternate versions of the data sheets to self-record SPT responses during sessions and in between the author's visits (Appendix C), as well as timers or digital clocks (already present in their homes). A variety of toys/activities (e.g., Jenga®, playing cards, Uno™, puzzles) were used for typical sibling-sibling with ASD game play sessions (described shortly). The author used timers to measure siblings' engagement durations and video cameras to record typical sibling-author training and typical sibling-sibling with ASD game play sessions.

Settings and Interventionist

The author administered the SB5 and ADOS in common areas in the home that had chairs and a table (e.g., kitchen, dining room). The author conducted all baseline, intervention, generalization, and maintenance sessions. Baseline, intervention, and maintenance sessions

occurred in the children's homes in a common play area (e.g., living room, finished basement). Generalization settings were secondary locations within the home in which both children played (e.g., sibling with ASD's bedroom) and a play location outside of the home (e.g., backyard). The author is currently a 7th year student in a Behavior Analytic doctoral program. She received Master of Arts degrees in Forensic Psychology and Psychology, as well as a Master of Philosophy degree in Psychology. She has been providing therapy using principles of Applied Behavior Analysis since 2008 and has been a Board Certified Behavior Analyst since 2011.

Dependent Measures

Measures of typical siblings' behavior and interactions with their siblings with ASD were obtained from 10-min game play sessions without author involvement. Sibling dyads played games of their choosing for 10 minutes without interruption every time the author visited. Game play sessions were video recorded for dependent measure analysis (described shortly), interobserver agreement, and intervention integrity purposes. Data collection began 30 seconds after at least one of the siblings entered the room. If either sibling left the room, data and video recording continued on the typical sibling.

To examine the first and second research questions, the author measured typical sibling *self-management responses* during each game play session. Self-management responses included the typical sibling a) setting SPT goals, b) identifying rewards for meeting goals, c) recording SPT responses, d) comparing responses to goals, e) determining if criteria were met to obtain the reward, and, if so, f) recruiting reinforcement. Self-management is reported as the percentage of correct responses out of the total required responses (Appendix B).

This author also measured *SPT responses* during each game play session. *Staying* required both siblings to remain within 1.5 meters of each other. The author only recorded a

change in distance if the siblings were further than 1.5 meters apart for more than 10 consecutive seconds. *Playing* was defined as both children engaging with the same toys by taking turns, moving items on the same materials (e.g., both children moving cars on the same track), or using the same materials (e.g., coloring using the same crayon set) (English et al., 1997). *Talking* occurred when the typical sibling engaged in intelligible verbalizations directed toward his/her sibling with ASD accompanied by concurrent responses, including eye contact, gestures, or physical orientation. If verbalizations did not coincide with eye contact, gestures, or physical orientation, but the content was directly related to the activity (e.g., "I like coloring, "The trains are leaving the station"), the author also counted it as *talking*. Prior to collecting baseline data, the author determined that the *final goals* for the SPT responses would be 10 minutes for *stay* and *play* and 10 comments for *talk.* These values were considered to be the ceiling for individual weekly *session goals*, that is, once a sibling met any of these final goals for *stay*, *play*, or *talk*, additional responses did not count toward the session goals (e.g., 10 comments and 23 comments during game play were considered the same in the Results section and Figures).

Typical siblings were required to demonstrate 100% correct self-management responding and meet all three SPT session goals across three consecutive sessions to meet mastery criteria.

During baseline, Zane demonstrated durations of staying and playing with Andrew, as well as frequencies of talking to Andrew, which exceeded the final goals. His mother reported that this behavior was not representative of how Zane and Andrew interacted when the author was not present. As a result, an additional dependent measure was identified to more accurately represent the typical behavior between Zane and Andrew when the author was not present.

Zane's mother recorded days during which the siblings engaged in unprompted interactions, which lasted at least 10 consecutive minutes.

To examine the third research question, the author examined social-communicative responses between typical siblings and their siblings with ASD. Eight game play sessions were reviewed for this purpose: the last baseline session before intervention, the last generalization session before intervention in each setting (i.e., in- and outside home), 2-week maintenance, 6-week maintenance, 14-week maintenance, and the last generalization session in each setting. For typical siblings who required booster sessions and subsequently repeated the maintenance session schedule (e.g., Susan received two 2-week maintenance sessions), the second maintenance session at a given interval was used for data purposes.

The author collected data from the siblings' 10-min game play sessions for *social-communicative responses* (defined in Table 2) on the part of each child using a 10-s partial interval time sampling. The eight coded sessions represented 80%, 62%, 75%, and 47% of non-intervention sessions for Zane/Andrew, Susan/Melissa, Colleen/David, and Gennifer/Robert, respectively. Social-communicative response data were also collected from the video recordings of four typical sibling dyads to provide a comparison with typical sibling-sibling with ASD participants.

Design

A multiple baseline probe design across participants was used to evaluate the presence of a functional relationship between a behavioral skills training package for self-management of a modified version of the SPT curriculum (Appendix A) on acquisition and generalization of typical siblings' self-management and SPT responses. Behavioral skills training consisted of instructions and modeling by the author, practice by the typical sibling with the author, and

subsequent feedback from the author based on the typical siblings' performance. Social-communicative interactions between the typical sibling-sibling with ASD were considered as a function of the intervention, as well as how they compared to typical peer interactions. Use of a probe design helped to decrease exposure to unnecessary sessions in the absence of intervention.

Procedure

The sequence of conditions with an overview of procedures as well as the assessments and data collection at each point in time is outlined in Figure 1.

Pre-baseline information collection. Within 2 weeks prior to baseline, the author administered the ADOS-G and SB5. Children's mothers (and father for Melissa) completed the CBC for both children and the RAISD for their child with ASD. Typical siblings completed a reward questionnaire created by the author.

Baseline game play sessions. Baseline involved observation of game play sessions in which the siblings played games for 10 minutes. During game play sessions the author instructed siblings to enter the intervention setting, choose toys with which to play, and play as they normally would. She placed self-management forms (Appendix C) on a table in sight of the typical sibling, but did not provide additional instructions. If either child exhibited challenging behavior that interrupted interactive play for longer than 30 seconds (e.g., aggression between siblings), the author intervened (e.g., blocked the negative interaction). Once challenging behavior did not occur for 15 seconds, the author increased distance to approximately 3.04 meters and did not become involved again. No feedback or consequences were in place for the typical siblings or their siblings with ASD during baseline sessions.

The observed durations of each typical sibling's staying and playing responses, along with frequency of comments, during baseline sessions were recorded to determine his/her initial

SPT intervention session goals. All siblings participated in at least two baseline sessions in the intervention setting (along with additional baseline sessions in the generalization settings, described shortly).

Intervention. Typical siblings participated in weekly training with the author. During training, the author introduced self-management and an SPT topic (i.e., stay, play, or talk) using behavioral skills training procedures involving instructions, modeling, feedback, and rehearsal (described in more detail in next section). After completion of that day's training, the sibling dyad engaged in game play sessions similar to baseline. Details about training and game play sessions are provided next.

Behavioral Skills Training. The author reviewed the self-management task analysis with the typical sibling (Appendix C) along with that day's SPT lesson (Appendix A). After introducing the lesson, the author modeled the SPT response and self-management responses while she engaged with the typical sibling. For example, she informed the typical sibling that she was setting the session goal to make 10 comments during their game. She identified earning 10 points as the reward for meeting the goal. She then self-recorded the frequency of her comments during her interaction with the typical sibling. After their game, she compared the frequency of her comments to the goal and determined if she met the goal. The typical sibling then rehearsed the SPT (e.g., stay within proximity of the author) and self-management responses during an interaction with the author, who assumed the role of the sibling with ASD. Typical siblings measured durations through timers or digital clocks, which were located throughout their homes, and frequencies using paper and pencil. Once determining if the goal was met, the typical sibling verbally indicated to the author whether he/she would or would not get reward. Parents were not included until after game play sessions (described next). After the typical sibling-author

interaction, the author provided feedback by reviewing the self-management task analysis with the typical sibling, praising steps completed correctly, and highlighting omitted or inaccurate responses. No additional practice with the author occurred during that visit, instead the sibling immediately preceded to a game play session with his/her sibling with ASD.

Intervention game play sessions. Intervention game play sessions began as in baseline, with the exception that the author instructed the typical sibling to self-manage his/her SPT responses with his/her sibling with ASD. Initial intervention SPT session goals were individually determined for each typical sibling, based on baseline data averages, and subsequently shaped across sessions. The author gave the typical siblings a range of goals that they could choose as SPT session goals based on their responding the prior session. For example, if, in the previous session, the typical sibling successfully stayed with his/her sibling with ASD for 6 minutes, the following session the author suggest that the typical sibling choose a goal from a range of 7-10 minutes to stay with their sibling. If, in the previous session, the typical sibling did not make 8 comments (goal for talk), then, the following session the author suggested that the typical sibling choose from a range of 7-10 comments. The author reminded both siblings of the reward system in place (described shortly) for compliance (child with ASD) and meeting goals (typical sibling). The author did not provide further instruction or specific feedback to the children while they played together.

Consistent with other peer and sibling training programs (e.g., English et al., 1997), a reward system was in place for each session. Both siblings earned points each session and then each had the opportunity to exchange the points for tangible rewards or save them to exchange at a later session for larger rewards (identified prior to baseline as previously described). The typical siblings earned points for accurately recording self-management responses (i.e., matching

author's data), 100% accuracy of self-management responses, and meeting all three SPT session goals. The siblings with ASD earned points for engaging in compliant behavior throughout the 10-min game play sessions with their sibling (i.e., remaining in the intervention room and not engaging in aggressive behavior). To increase the likelihood of generalization and maintenance, both children recruited reinforcement from parents, rather than the author.

Immediately after intervention game play sessions the typical sibling determined if he/she had met the SPT goals and, if so, proceeded to recruit reinforcement from his/her parents. The author observed and intervened if the typical sibling attempted to recruit reinforcement when he/she did not meet the SPT goals to earn it. Once the sibling brought his/her data sheet/visual support to his/her parent, the parent provided praise, reviewed how many points the child earned (i.e., meeting each SPT session goal), and together they consulted the menu of choices and decided whether the child would exchange his/her points for an immediate, lower quality reward or save points for a delayed, higher quality reward (determined by preference assessment. Each child's parent determined the point assignment for corresponding tangible rewards.

Once the typical sibling completed point exchange with their parent, the author met with the typical sibling. They compared their recordings of the siblings SPT and self-management responses and the author provided feedback on performance. The author reviewed agreements and disagreements with the typical sibling and provided additional points to be exchanged with the sibling's parent. The author also met with the sibling with ASD to provide a laminated visual support (e.g., smiling face), which represented points to be exchanged for tangibles, if he/she was compliant during the session. If the typical sibling and/or the sibling with ASD met criteria for a reward, the author sent him/her to bring the data sheet or visual support to his/her parent.

Once either child brought his/her data sheet/visual support to his/her parent, the parent engaged in the same reinforcement procedures as previously described.

Setting session SPT goals. Typical sibling baseline performance determined separate staying, playing, and talking session goals, which were subsequently shaped to make progressive improvements across sessions. An average duration of how long typical siblings stayed within the designated distance of their siblings with ASD was calculated across baseline sessions. The average duration was rounded down to the nearest minute and used as the initial *staying* session goal. After each session that the typical sibling met the session goal, the *staying* session goal increased by 1 minute, and decreased by 1 minute if he/she did not meet the goal. Similarly, the average duration of *playing* between siblings during those 10 minutes was calculated from baseline. The average duration was rounded down to the nearest minute and used as the initial *playing* session goal. The *playing* session goal increased by 1 minute each session that the typical sibling met the session goal and decreased by 1 minute if s/he did not meet the session goal. Finally, for the *talking* session goal, the average number of comments made toward the sibling with ASD was calculated and rounded down to the lower integer as the initial session goal. Each session during which the *talking* session goal was met, the subsequent session goal increased by 1 comment and decreased by 1 comment if the session goal was not met. Stay, play, and talk criteria increased on an individual basis. For example, if a typical sibling met the *stay* and *play* goals (e.g., 7 and 5 minutes, respectively), but did not meet the *talk* goal of 3 comments, then the following session the *stay* and *play* session goals increased (i.e., 8 and 6 minutes, respectively) while the *talk* session goal decreased (i.e., 2 comments).

Once SPT (3 consecutive sessions of meeting all three session goals) and self-management responses (3 consecutive sessions of 100% correct task analysis) met mastery

criteria, a setting generalization and maintenance probe schedule began (discussed shortly). Siblings did not need to meet final goals of 10 minutes of staying and playing and 10 comments/talks to meet mastery criteria. Rather, SPT goals continued to increase across maintenance sessions until staying and playing reached 10 minutes and the typical sibling made 10 comments to his/her sibling with ASD.

***Modification*.** Due to challenging behavior emitted by Robert toward Gennifer, the author modified the training sessions with Gennifer. This began on the first day of the maintenance probe schedule (i.e., first 2-week probe). The author created an additional lesson which addressed how to react to Robert's yelling, pushing, and throwing items (see Appendix A). The author taught Gennifer to state that she wanted to take a break from playing with Robert, move away from Robert by at least 3.05 meters, and wait 5 minutes before asking if Robert wanted to continue playing. If Gennifer engaged in the "ask for a break" response within 30 seconds of Robert's yelling (observed antecedent to pushing or throwing items), she received points using the previously described reward system. If, after the 5-min break, Robert indicated that he did not want to continue playing, then Gennifer received points for accurate self-management data, agreement with the author, and "ask for a break" responses, but not for SPT session goals. If Robert responded positively, their interaction continued from where it had stopped and Gennifer had the opportunity to receive points for meeting self-management and SPT goals.

Maintenance

After a typical sibling met mastery criteria (i.e., three consecutive sessions with 100% self-management and meeting all three SPT session goals), the author continued to visit the typical sibling up to 14 weeks after intervention to measure maintenance. The author visited each

sibling 2, 6, and 14 weeks after the last intervention session. Maintenance sessions consisted of only game play sessions (i.e., no training sessions with the author). Maintenance sessions were conducted in the intervention setting with the author instructing the siblings to play. The author did not instruct the sibling to use the self-management data sheets, but, once the sibling began to fill it out, the author suggested goal ranges as she had during intervention. In this way, the sibling's SPT behavior continued to systematically increase over maintenance sessions until he/she reached final goals of 10 minutes of staying and playing and 10 comments. Once the sibling reached 10 minutes of staying and playing and 10 comments, the author no longer provided suggested goals in subsequent sessions.

During maintenance the point system was modified such that children with ASD continued to receive points for general compliance during interactions with their typical siblings, however, typical siblings only received points for engaging in 100% of self-management responses. Points for agreement with the author were discontinued, as well as points earned for meeting SPT session goals. Points were not provided directly for SPT responses after intervention ended to determine whether self-management maintained meeting SPT goals, rather than direct reinforcement. Stay-Play-Talk responses continued to receive indirect reinforcement as meeting SPT goals were embedded in the self-management response chain.

Booster Sessions

If self-management or SPT responding fell below mastery criteria during maintenance probes in the intervention setting, the author conducted a training session immediately following the siblings' game play session. If self-management responding fell below criteria, the author reviewed the self-management task analysis with the typical sibling, providing praise for correct responses and corrective feedback for incorrect or omitted responses. If the typical sibling did

not meet an SPT goal, the author reviewed the corresponding SPT lesson. The typical sibling then rehearsed the self-management and SPT responses with the author who provided corrective feedback, if necessary. Once the typical sibling engaged in 100% self-management and SPT responses with the author, he/she played with his/her sibling with ASD again. When responding returned to 100%, the typical sibling received praise from the author, but no points, and the maintenance session schedule began again at 2 weeks.

Generalization

Generalizations sessions consisted of game play sessions in two generalization settings, one in the home and one outside of the home. Generalization sessions conducted during baseline had no scheduled consequences for the typical sibling's engagement in self-management or SPT responses, as in baseline sessions. During generalization sessions after training, the author continued not to provide feedback, but did use the modified point system in place for self-management of SPT responses.

Interobserver Agreement

Game play sessions across baseline, intervention, generalization, and maintenance conditions were video recorded and then subsequently reviewed and coded by two research assistants for interobserver agreement (IOA) of self-management and SPT responses. For Zane and Susan, self-management and SPT IOA was calculated for 50% of baseline and 100% of intervention, generalization, and maintenance game play sessions. For Colleen and Gennifer, self-management and SPT IOA was calculated for 100% of sessions across all conditions.

The author trained each research assistant before viewing any sessions for IOA purposes. For self-management responses, the author gave the research assistants the task analysis for self-management that the typical siblings followed. For each step of the self-management task

analysis, the research assistant recorded whether s/he observed the typical sibling engage in the target step. The author then calculated self-management response IOA by dividing the number of agreements across all task analysis steps by total agreements plus disagreements, multiplied by 100%. Results indicated 100% agreement of self-management responses across all typical siblings and conditions.

To train the research assistants to record IOA for SPT and social-communicative responses, the author used video recordings of children, not included in this study, to demonstrate correct and incorrect instances of the target responses. Each research assistant and the author recorded practice data simultaneously until they obtained 80% agreement across two training videos. The author trained each research assistant separately. Stay-Play-Talk response IOA was calculated by whole session agreement or disagreement. Using a timer, the research assistant calculated the durations during which the typical sibling stayed within proximity and played with their sibling with ASD. They also recorded the frequency of comments made by the typical sibling toward their sibling with ASD. The durations and frequencies recorded by the research assistant were compared to the data collected in vivo by the author. For SPT responses, agreements occurred when both the author and research assistant recorded durations (stay, play) within 10 seconds and exact frequency (talk) agreements. Disagreements occurred when durations of staying or playing were greater than 10 seconds different between the author and research assistant or there was any difference between the author and research assistant's frequency of comments. Interobserver agreement was 100% for SPT responses across all conditions for Zane, Susan, and Colleen. For Gennifer, IOA was 100% for baseline, intervention, and maintenance and 89% for generalization sessions. There were two *talk* and one *stay* disagreements during generalization sessions outside the home.

For social-communicative responses, agreements were defined as when both the author and research assistant independently recorded the same interval with the presence or absence of a social-communicative response for each child. Disagreements occurred when one person recorded the presence of a social-communicative response during a 10-s interval whereas the other person did not. The research assistants viewed video recordings and recorded data, independent of the author. Interobserver agreement was calculated to be 85% (range, 77-100%) for 38% of the sessions coded for social-communicative responses for all typical siblings.

Interobserver agreement of the whole interval data collected by Zane's mother was compared to the data reported or collected by Zane himself. The author asked Zane to record on a calendar the days that he interacted with Andrew for 10 consecutive minutes. The information collected by Zane was compared to the data collected by his mother. Agreements were calculated if both Zane and his mother reported that the brothers had interacted for 10 consecutive minutes on a given day or that both Zane and his mother agreed that the brothers had not interacted that day. Disagreements were considered if Zane or his mother reported that the brothers interacted, but the other reported that the brothers did not interact that day. Interobserver agreement was collected daily across 5 months and agreement between Zane and his mother was 95%.

Intervention Integrity

The author created a manual of the training procedures (summarized in Appendix A). A task analysis (Appendix D) was derived from the manual for the research assistant to record data of training procedures. A selection of baseline, intervention, maintenance, and generalization sessions were video recorded and subsequently reviewed and coded by a research assistant for intervention integrity purposes. Intervention integrity was measured as the number of responses on the task analysis the interventionist correctly implemented divided by the total number of

responses, multiplied by 100%. Intervention integrity was calculated to be 100% across 33% of baseline sessions, 35% of maintenance sessions, and 36% of generalization sessions. Intervention integrity was calculated to be 94% across 50% of training and intervention sessions. The omitted step was consistently the review of the self-management task analysis which the typical siblings did not appear to need after the second intervention session.

Results

Does behavioral skills training result in improvements in typical siblings' self-management of the SPT curriculum?

Figure 2 presents self-management and combined SPT performance across all typical siblings during baseline, intervention, maintenance, and generalization. Self-management performance is represented as the percentage of the typical siblings' correct responses out of the total task analysis of steps for each session. Combined SPT performance refers to the percentage of stay, play, and talk goals that the typical sibling met in a session (i.e., 0, 33, 67, 100%). Mastery criterion was 100% self-management and SPT goals across three consecutive sessions. Results from self-management and SPT responses in baseline and intervention sessions within the intervention setting will be discussed next. Results within the generalization settings (before and after intervention) and during maintenance will be discussed later.

Self-management. Typical siblings demonstrated no self-management responses during baseline sessions (Figure 2). Once intervention began, each typical sibling demonstrated marked increases, performing self-management responses at 100% upon the first session of training for Zane, Colleen, and Gennifer, and the second session for Susan.

Stay-Play-Talk. Figure 2 also shows the combined percentage of SPT session goals the typical siblings met each session (i.e., 0, 33, 67, or 100%). During baseline, the author evaluated the typical sibling's performance compared to final goals for the SPT responses (10 minutes for *stay* and *play* and 10 comments for *talk*). For example, if, during baseline, the typical sibling made 10 comments toward their sibling with ASD, their performance met the final *talk* goal and the author recorded that the typical sibling met that goal. If the sibling stayed within the target proximity for 2 minutes during baseline, they did not meet the final *stay* goal and did not receive

credit for meeting that SPT response goal for that session. Initial intervention session SPT goals were individually determined for each typical sibling, based on each child's baseline data averages, and subsequently shaped across sessions until they reached the final goals.

Zane (top panel) engaged in all SPT responses to final goal levels in both baseline sessions and continued to do so in the following three intervention sessions. Zane's mother reported this was not representative of behavior when the author was not present. As an additional measure of Zane's interactions with his brother, Zane's mother recorded the frequency of days each week during which Zane and Andrew engaged in activities together for 10 consecutive minutes (outside of sessions associated with this research), shown on the right hand axis. Zane and his brother did not interact for the first 3 weeks of baseline and did so one time during the fourth week. Over the 5 weeks of intervention, Zane's mother reported a high of four interactions during the last week of intervention. Zane's mother collected data for 3 out of 5 intervention weeks due to Zane leaving the home for vacation for 1 week without Andrew and a second week Zane's mother was hospitalized.

Susan (second panel) demonstrated variable SPT performance during baseline (33%, 66%), which continued across the first two intervention sessions, before meeting all SPT session goals (100%) during the last two intervention sessions. Susan only scored 100% across 2 consecutive sessions before beginning maintenance and generalization sessions due to the author's error. Colleen (third panel) showed consistent SPT responding at 66% during baseline. She consistently met the final *stay* and *talk* goals (10 minutes and 10 comments, respectively), but did not meet the final *play* goal of 10 minutes. Her performance increased to 100% in the first intervention session and remained at 100% for the rest of intervention. Colleen received four intervention sessions due to the fact that there was an extended break between her first and

second intervention sessions. Gennifer (bottom panel) met no SPT response goals (0%) during baseline sessions. Her performance increased to 100% in the first intervention session and remained at 100% for the rest of intervention.

Figures 3-6 show each typical sibling's individual *stay, play,* and *talk* performances across all sessions, along with the individual session goals that increased from baseline levels to final goal levels of 10 minutes of *staying* and *playing* and 10 comments (*talk*). Looking at Figures 3-6 allows for an examination how individual SPT session goals changed over the course of intervention. Session goals were individualized depending upon baseline performance and continued to change across intervention and maintenance sessions. Mastery criterion was meeting all three individual SPT goals for 3 consecutive sessions. Figures 3-6 show that, during baseline sessions in the intervention setting, participants *stayed* for 10 minutes (7 out of 10 sessions) and *talked* by making 10 comments (6 out of 10 sessions) more often than they *played* for 10 minutes (2 out of 10 sessions). Both sessions of *playing* for 10 minutes were with Zane and Andrew. All participants demonstrated improvements in SPT session goals over the course of intervention. The average initial session goals across participants were 8:45 minutes for *stay,* 4:15 minutes for *play,* and 7 *talk* responses. By the end of intervention, three typical siblings *stayed* and *played* for 10 minutes and *talked* 10 times, while Gennifer *stayed* for 8 minutes, *played* for 7 minutes, and *talked* 10 times.

Zane (Figure 3) participated in two baseline and three intervention sessions in the intervention setting in which he *stayed* and *played* for 10 minutes and made 10 comments for *talking* goals. Susan (Figure 4) participated in two baseline sessions in the intervention setting during which she engaged in consistent *staying* (M = 10 minutes), but inconsistent *playing* (M = 4 minutes, range, 3-5 minutes) and *talking* (M = 5 comments, range, 0-10 comments). She

participated in four intervention sessions, where *staying* initially decreased from baseline, but then returned to baseline levels (M = 7.5 minutes, range 5-10 minutes). Susan increased *playing* (M = 7.5 minutes, range, 5–10 minutes) and *talking* (M = 7.8 minutes, range, 3–10 comments) from baseline. By the last intervention session, Susan met all final SPT goals. Colleen (Figure 5) participated in three baseline sessions in the intervention session during which she met the final goals for *staying* (10 minutes) and *talking* (10 comments), but not for *playing* (M = 2 minutes, range, 0–3 minutes). Once intervention began, she immediately increased her *playing* to 10 minutes each session and continued to meet the final *staying* and *talking* goals. Gennifer (Figure 6) participated in three baseline sessions in the intervention setting during which she did not meet any *stay* (M = 5 minutes, range, 3–8 minutes), *play* (M = 1 minute, range, 0–3 minutes), or *talk* (M = 3.67 comments, range, 2–6 comments) final goals. During the three intervention sessions, she exceeded all *stay, play, and talk* session goals. Gennifer's performance of *staying* (M = 9.3 minutes, range, 8–10 minutes) and *playing* (M = 8.6 minutes, range, 7–10 minutes) increased from baseline to intervention, but only *talking* reached the final goal of 10 comments across all three intervention sessions.

A functional relation was demonstrated between the behavioral skills training intervention and self-management responses for all four typical siblings. Three typical siblings also demonstrated an increase in the percentage of SPT session goals met, which corresponded to the introduction of intervention, as well as progressively longer durations of *staying, playing,* and/or higher frequencies of *talking* responses. One typical sibling, Zane, already emitted SPT responses to mastery criteria during baseline sessions, but engaged in more frequent interactions with his brother with ASD once intervention began, in comparison to baseline.

Do improvements in self-management and SPT responses generalize across settings and maintain across time?

Generalization. As shown in Figure 2, during baseline, typical siblings demonstrated comparable self-management responses in the intervention setting and both generalization settings (0%). Because generalization was examined in probe sessions, we describe performance as meeting the mastery level of 100% in a single probe session. After intervention, all siblings demonstrated increases in self-management to 100% across both generalization settings.

Figure 2 also depicts SPT responses across generalization settings for all siblings. Prior to intervention, during in-home generalization sessions, Zane *stayed* and *played* with Andrew for 10 minutes and made 10 comments for *talking*. In addition, the daily interaction data collected by Zane's mother (previously described) was not limited to the intervention setting and accounted for interactions between Zane and Andrew across numerous settings, both within and outside of the home. Colleen also demonstrated some engagement in SPT responses within the in-home generalization setting before intervention (66%), but not to final goal levels. Neither Susan nor Gennifer engaged in any SPT responses in the in-home generalization sessions before intervention (0%). After intervention, all siblings *stayed* and *played* for 10 minutes while making 10 comments for *talking* during in-home generalization sessions (100%).

Zane, Susan, and Colleen also showed improvements in their performance of SPT responses outside the home from before (33%, 0%, and 67%, respectively) to after intervention (100%). Gennifer's performance initially improved during one outside home generalization session after intervention (100%), but then decreased to baseline levels during the second outside home generalization session (33%).

Figures 3-6 show individual SPT responding in generalization settings in the context of the individual session and final goals. Zane *stayed* and *played* for 10 minutes and made 10 comments for *talking* during the in-home generalization session during baseline and the two sessions after intervention. During the outside home generalization session before intervention, he made 10 comments (i.e., *talk*) to Andrew, but only *stayed* and *played* for 8 minutes. After intervention, he met final goals for all three SPT responses during outside home generalization sessions (Figure 3).

Before intervention, Susan did not meet any SPT final goals in the in- or outside home generalization settings (Figure 4). During in-home generalization sessions, on average, she *stayed* for 4.5 minutes, *played* for 3.5 minutes, and made 5 comments for *talking*. During outside home generalization sessions, on average, she *stayed* for 9 minutes, *played* for 2 minutes, and made 7 comments for *talking*. After intervention she *stayed* and *played* for 10 minutes and made 10 comments for *talking* in both generalization settings.

Colleen met final *staying* and *talking* goals, in both generalization settings before intervention (Figure 5). This level of performance maintained after intervention. Before intervention, she *played* with David for approximately 4 and 6 minutes during in- and outside home generalization settings, respectively. *Playing* between Colleen and David increased to 10 minutes during all generalization sessions after intervention.

During baseline, Gennifer made 10 comments (*talk)* in one outside home generalization session, but did not *stay* or *play* for 10 minutes or make 10 comments (*talk*) with Robert in any of the other generalization sessions (Figure 6). Before intervention, on average, she *stayed* and *played* with Robert for less than 1 minute and made 4 comments (*talk*) during in-home generalization sessions. During outside home generalization settings, on average, she *stayed* with

Robert for 5 minutes, *played* for 0 minutes, and made 6 comments (*talk*). After intervention, on average, she *stayed* and *played* with Robert for 8 minutes and made 10 comments during in-home generalization sessions, whereas, on average, she *stayed* for 6 minutes, *played* for 2 minutes, and made 10 comments (*talk*) during outside home generalization sessions.

Maintenance. Typical siblings generally continued to engage in self-management and SPT responses, when in the intervention setting, across 2-, 6-, and 14-week follow-up sessions (Figure 2). Two participants, Zane and Colleen, maintained self-management and SPT responding at 100% across all three maintenance probes. Zane's mother's report indicated that Zane continued to engage in a higher frequency of interactions with Andrew across 14 weeks of maintenance (M = 2.21, range, 1-6) than he did during baseline (M = 0.33, range 0-1).

Two participants, Susan and Gennifer, needed booster sessions at the 2- and 6-week follow-up sessions, respectively. Susan fell below mastery level for self-management at the first 2-week maintenance session (80%). She did meet criteria for her SPT goals (100%) (Figure 4). During the booster session, she met criteria for self-management and SPT goals and then continued to maintain responding across the subsequent 2-, 6-, and 14-week maintenance probes. Since she met SPT session goals at the first 2-week maintenance, the goals continued to increase at the second 2-week session (as previously described).

For Gennifer, the author modified the intervention during the first 2-week maintenance probe; Gennifer was taught to take a break from interacting with Robert when he engaged in verbal (i.e., yelling) aggression. She maintained performance at 2 weeks; during Gennifer's first 6-week maintenance session in the intervention setting, she continued to self-manage, but did not meet any SPT goals (0%) (Figure 6). After participating in a booster session, Gennifer engaged in self-management and SPT at 100%. She began the maintenance schedule again and received

additional 2- and 6-week maintenance sessions, during which she continued to meet criteria, as well as during the subsequent 14-week probe session. Since the reason for a booster session was due to SPT responding failing to meet session goals, the goals did not increase again until Gennifer was successful at the following 2- and 6-week maintenance sessions.

Two typical siblings received booster sessions – one to address self-management responses and the other to target SPT responses. With those booster sessions, all typical siblings demonstrated generalization and maintenance of both self-management and SPT responses, except for one sibling, Gennifer, in one generalization setting (outside home).

Are improvements in self-management and SPT responses associated with improvements in sibling interactions?

Figure 7 shows the percent of intervals with social-communicative responses across all participants during baseline, maintenance, and generalization sessions (i.e., not including intervention). For the two typical siblings who required booster sessions, only the maintenance sessions *after* the booster sessions were included in this analysis. In other words, Susan's first 2-week maintenance probe and Gennifer's first 2- and 6-week maintenance sessions were not included. The horizontal line on each graph shows the average intervals during which the four typically developing sibling dyads engaged in social-communicative responses (71%).

Two typical siblings (Susan, Gennifer) demonstrated increases from baseline to the 2-week maintenance sessions in the intervention setting, while Zane and Colleen maintained high percentages demonstrated in baseline. All typical siblings maintained improvements across 6- and 14-week maintenance sessions, except Susan's 6-week probe session. Zane and Colleen demonstrated high percentages of social-communicative responses across all generalization

sessions, whereas Susan and Gennifer showed improvements across both generalization settings from before to after intervention.

All four siblings with ASD showed improvements from baseline to the 2- and 6-week maintenance sessions in the intervention settings. By the 14-week maintenance session, two siblings with ASD (Andrew, Robert) maintained improved social-communicative responses, but David's performance returned to baseline levels and Melissa's fell below what was observed during her baseline session. Andrew demonstrated high percentages of social-communicative responses across all generalization sessions, whereas Melissa and Robert showed improvements across both generalization settings from before to after intervention. For David, the percentage of intervals with social-communicative responses decreased in the in-home generalization setting after intervention and increased in the outside home generalization setting.

As a measure of social validity, each sibling's social-communicative responses were compared to their typical peers during baseline and maintenance in both the intervention and generalization settings. At baseline two typical siblings (Zane, Colleen) and no siblings with ASD engaged in social-communicative responses across at least as many intervals as their typical peers (71%, shown by horizontal line) and, by the 2-week maintenance visit, three typical siblings (Zane, Colleen, Gennifer) and one sibling with ASD (Andrew) did so. At the 6-week maintenance session, three typical siblings (Zane, Colleen, Gennifer) and three siblings with ASD (Andrew, Melissa, Robert) showed comparable social-communication responding to their typical peers. By the 14-week maintenance session, all typical siblings continued to respond higher than their typical peers, except Gennifer (67%), though she did respond more similarly then than she had during baseline (38%). Both Andrew and Robert (90% and 77%, respectively)

responded higher than typical peers at the 14-week maintenance, but Melissa (27%) and David (48%) fell below the typical peer comparison.

In general, typical siblings engaged in social-communicative responses more comparable to their typical peers after intervention, which maintained across 14 weeks and generalized across both settings. All four siblings with ASD initially engaged in social-communicative responses more comparable to their typical peers after intervention, but maintenance and generalization were more variable than demonstrated by their typical siblings.

Interactions between typical siblings and their siblings with ASD improved (i.e., higher percentages of intervals with social-communicative responses) after receiving intervention for two dyads, while a third dyad demonstrated high percentages of social-communicative responses during baseline and there was limited room for improvement (i.e., ceiling effect). The fourth sibling dyad also showed improved interactions in post-intervention probes, compared to baseline, but improvements were inconsistent across maintenance sessions.

Discussion

In this study a functional relationship was demonstrated between a behavioral skills training intervention on typical siblings' self-management (goal setting, monitoring, and recruiting reinforcement) of a social skills curriculum, as well as corresponding changes in social-communicative responses by both typical siblings and their siblings with ASD. These target responses largely demonstrated both generalization across settings and maintenance over time. All four typical siblings learned to self-manage their engagement in the Stay-Play-Talk curriculum (English et al., 1997). Two typical siblings maintained high percentages of intervals with social-communicative responses across conditions, while two typical siblings demonstrated improvements from baseline to after intervention. These improvements were largely demonstrated across 2-, 6-, and 14-week maintenance sessions and both in- and outside home generalization settings, albeit less than in the intervention settings. Alternatively, all siblings with ASD showed improved social-communicative responses from baseline to after intervention, but only two maintained improvements through the 14-week maintenance sessions. Three siblings with ASD increased social-communicative responses across at least one generalization setting from before to after intervention, while one sibling with ASD maintained high percentages from before intervention.

Does behavioral skills training result in improvements in typical siblings' self-management of the SPT curriculum?

This is the first study that taught typical siblings to self-manage their engagement in social behavior toward their siblings with ASD. Results suggest self-management may be a valuable skill set to teach typical siblings of children with ASD as it may directly impact the likelihood of generalization and maintenance of targeted skills. One challenge in teaching new

skills to improve interactions between typical sibling-sibling with ASD dyads is that the proportion of opportunities the siblings have to interact in the interventionist's absence is significantly larger than the proportion with the interventionist present. An interventionist cannot be present to monitor and consequate (through reinforcement and error correction) every sibling interaction. By teaching typical siblings to self-manage their own interactive behavior and access corresponding consequences, their interactive behavior that occurs when the interventionist is not present should still result in the appropriate consequences to support skill acquisition (i.e., reinforcement for correct responses and no reinforcement for incorrect responses).

A second concern related to sibling interventions is preventing an irrelevant antecedent stimulus, such as the interventionist, does not develop stimulus control over the targeted behavior of the siblings (i.e., faulty stimulus control). This can occur if the presence of the interventionist signals the availability of reinforcement (i.e., discriminative stimulus) and his/her absence signals its unavailability (i.e., S-delta). To prevent this from occurring, in the current study, siblings recruited reinforcement from caregivers, who were regularly present compared to the author, which allowed for reinforcement to be available for engagement in the target responses in between the author's visits. In the current study, even with sibling self-management and parent-delivered reinforcement, the author may have still served as a discriminative stimulus for the typical sibling's behavior, as it seemed for Zane and Andrew. Zane's mother collected data, in the absence of the author, which supported her claim that the boys rarely interacted outside of baseline sessions. After the introduction of intervention, Zane's mother reported increases in the siblings' interactions in the author's absence. We do not have similar measurements for the other sibling participants so it is not possible to make further conclusions regarding stimulus control in the current study. Self-management interventions should minimize

this issue of faulty stimulus control, but, in the future, researchers may consider the impact of further removing the interventionist from intervention procedures, such as by including parents in self-management training, more than just providing reinforcement.

A third consideration is that there are two consumers in each sibling dyad, so only targeting the behavior of the typical sibling may not necessarily address the barriers in their interactions with their sibling with ASD. Given the effectiveness of self-management with typical siblings in the current study and other research showing children with ASD have learned to self-manage their own engagement in various responses (e.g., Koegel, Koegel, Hurley, & Frea, 1992), this intervention could be expanded to target both siblings' behavior. For example, if typical siblings self-manage the number of comments made to their siblings with ASD, but the siblings with ASD never, or rarely, respond to those initiations, then there may not be any naturally occurring consequences to maintain further initiations in the future. As a result, in this example, it may be more effective and socially valid to simultaneously teach the typical siblings to self-manage their initiation of comments, while teaching the siblings with ASD to self-manage responses. Siblings with ASD might also self-manage behavior that may actually punish the typical siblings' attempts to have social interactions. For example, anecdotally, many of Zane's comments to Andrew were responses to Andrew's stereotypic question-asking behavior, which Zane appeared to find frustrating (e.g., rolling eyes, sighs with response). If Andrew was taught to self-manage the number of questions asked during interactions with Zane, this may also have qualitatively improved their interactions, something not captured in the SPT measure.

In addition to learning to self-manage, three typical siblings improved their overall SPT responses after intervention, compared to baseline responding, which further maintained across 14-week probes and generalized across two novel settings. Tsao and Odom (2006) also taught

typical siblings the SPT curriculum. In the current study, there was variability between the typical siblings' engagement in individual *stay*, *play*, and *talk* responses with their siblings with ASD during baseline. Zane engaged in all three target social skills, Colleen consistently met two goals, and Gennifer did not engage in any of the goals to a mastery level during baseline. Susan met one SPT goal in the first baseline session and then two SPT goals in her second baseline session. As a result, it may have been more appropriate to introduce intervention with Gennifer or Colleen before Susan. In addition, at least three baseline data points would have been better (than the two collected in the current study) for each sibling dyad since it is difficult to predict trend with only two data points (Cooper et al., 2007).

The variability in SPT responses across siblings in baseline indicates the heterogeneity of need in this population. The SPT curriculum is a useful start to be able to conduct a basic component analysis of three responses necessary to maintain reciprocal interactions (i.e., staying within proximity, playing interactively with shared objects, and initiating and responding to comments) to determine which are deficits in that particular dyads interactions. For those with limited skills, it provides a guide on how to progressively shape complex behavior. It is possible that pre-identifying a general curriculum, like SPT, may not necessarily best address the individualized needs of all siblings. This can be seen in the case of Gennifer for whom we needed to introduce an additional lesson to ensure her safety. Future researchers should consider identifying a larger number of social skills to assess in baseline to determine individualized targets for each dyad. Typical siblings may also assist in identifying the target responses they would like to learn or what they think would help them have more positive interactions with their siblings. This could then further serve as a measure of social validity of the intervention goals.

Do improvements in self-management and SPT responses generalize across settings and maintain over time?

Results from the current study supported maintenance of self-management and SPT responses across 2-, 6-, and 14-week maintenance probes, as well as across two novel setting generalization probes. This was a longer maintenance period than considered in previous research (e.g., 3 months in Baker, 2000; 3 weeks in Tsao & Odom, 2006). Two typical siblings required additional booster sessions once they began the maintenance probe schedule, but then maintained responding across all subsequent maintenance probes after the booster session. Gennifer initially demonstrated an improvement in both SPT and self-management responses in the outside home setting after intervention, but then her SPT performance declined to baseline levels between the 2- and 6-week maintenance probe sessions (self-management maintained). Given that, at the 6-week maintenance session, she received a booster session, it would have been informative to perform an additional outside home generalization probe after the booster session to see whether it improved her performance. In addition, neither Susan nor Colleen participated in generalization sessions between the 6- and 14-week maintenance sessions. Additional sessions would have helped show generalization of target responses after intervention ended. Researchers may consider replicating this study with additional generalization sessions between the 6- and 14-week maintenance sessions.

The two siblings who participated in booster sessions did so at different points in time. It is not clear how to predict the need for booster sessions. Observations from this study suggest characteristics of the sibling or family may assist with identifying the need for booster sessions. First, the age of the typical sibling at the time of intervention could affect their ability to maintain responding. Both typical siblings who required booster sessions were younger (6 years old) than the two siblings who did not (10 and 12 years old). It is likely easier for older siblings to retain

and emit the target behaviors over longer intervals without instruction compared to younger siblings. Second, birth order may also impact the typical sibling's ability to engage in certain skills over extended maintenance periods. Both of the typical siblings who required booster sessions were younger than their siblings with ASD; both siblings who did not require booster sessions were older than their siblings with ASD. It may be more difficult for younger typical siblings to set up the occasion to interact with their older siblings. Third, the typical sibling's overall cognitive functioning may also impact his/her ability to maintain target responses across extended durations between direct instruction. Gennifer had the lowest full scale percentile on the Stanford-Binet, compared to the other typical sibling participants, and her non-verbal scale percentile was lower than the standardized average of 50% (but was still within normal range). Fourth, the compliance of the siblings with ASD may also impact the typical sibling's performance. Both Andrew and David were largely compliant with the activities; whereas, both Melissa and Robert sometimes rejected activities suggested by their typical siblings and/or repeatedly asked when they would be done playing. These types of interactions could directly impact typical siblings' abilities and willingness to engage in the target responses. Finally, the author anecdotally noted that both older typical siblings, who did not require booster sessions, completed self-management forms with their siblings with ASD in between the author's visits, whereas the younger typical siblings, who did receive booster sessions, did not. While this was not a formal dependent measure, it is arguable that the overarching purpose of teaching self-management responses was so that the typical siblings would engage in those behaviors in the author's absence. It is possible that the demonstration of self-management responses in the author's absence indicated a higher level of performance and, as a result, mitigated the need for booster sessions. The ability to predict the need for booster sessions is likely not determined by

any one of these characteristics, but rather a combination of these, plus other potential factors outside the scope of this discussion. For example, Tomeny, Barry, and Bader (2014) found that typical siblings demonstrated higher levels of behavior problems when their sibling with ASD was older *and* demonstrated their own higher levels of externalizing behavior.

In addition to those factors, and potential others, another consideration in the need for booster sessions is the maturation of both siblings. As the siblings age, both of their interests and responses will change, which will require an increasing amount of both response and stimulus generalization to maintain responding. As children, the typical siblings may need to generalize the self-management and SPT responses across various types of games and toys. As they mature into adolescence, it may be more appropriate for the typical siblings to self-manage offering to go on community outings or assist in teaching their siblings daily living skills (e.g., a brother teaching his brother how to shave, a sister teaching her sister to put on makeup). Future researchers should consider whether the typical siblings spontaneously generalize self-management to different target responses. With a generalized self-management repertoire, new behaviors can be easily introduced to support positive interactions as the children age and their needs change.

Given all these variables, as well as how the siblings' interactions and needs change over time, the question may not be if booster sessions are necessary, but, as suggested by Weinrott (1974) and McLinden et al. (1991), rather when they are necessary to ensure the long-term maintenance that would benefit siblings. To answer when booster sessions may be necessary, numerous factors need to be considered, including, but not limited to, the factors mentioned (i.e., age, birth order), the amount of passed time since the last intervention session, and how the interests and needs of the siblings changed in that time. Given the complexity of simultaneously

considering all these factors and determining a quantifiable interval, other approaches that ensure natural supports for the siblings may provide a better way to approach maintenance and generalization. Parent training to teach self-management, as discussed previously, may be one approach to address the need for ongoing support as the siblings' mature.

Are improvements in self-management and SPT responses associated with improvements in sibling interactions?

In addition to measuring SPT responses, sibling interactions were examined for social-communicative responses, such as eye contact, gestures, and vocalizations, as a measure of the sibling relationship. Sibling social-communicative responses were examined before and after intervention in both the intervention (i.e., baseline, maintenance) and generalization settings. For the typical siblings, this measure included response topographies, which were not directly targeted, but may have changed as a function of intervention, such as eye contact and gestures. Two typical siblings continued to maintain high percentages of intervals with social-communicative responses across all conditions, while two showed improvements from baseline across 14-week maintenance probes, with the exception of one session for Susan. For the siblings with ASD, this measure of social communicative responses was the only direct measure of their behavior as a function of their involvement in the intervention procedures. All four siblings with ASD showed improvements in the percentage of intervals with social-communicative behavior from baseline to the 2- and 6-week maintenance probes, which continued for two of the children through the 14-week maintenance probe.

The limited improvements demonstrated by the siblings with ASD are likely attributed to the fact that they did not receive direct teaching during this intervention. The social-communicative responses by the siblings with ASD were measured to determine if there may be

collateral behavior change corresponding to their typical siblings' learning to self-manage the SPT curriculum. As previously discussed, more salient improvements in the siblings' with ASD behavior would likely be observed if they had received direct instruction themselves, such as teaching them to self-manage their own engagement in SPT responses. Future researchers should consider the generalization and maintenance of social behavior by each sibling toward the other when both siblings receive intervention to increase the quality of sibling dyad interactions.

Social-communicative responses provided an important additional measure by considering interactions between the siblings, which were not captured in the SPT operational definitions. For example, in the current study, at the 6-week maintenance probe, Susan emitted 10 comments at a high rate to meet the session talk goal and then continued to stay and play, but the interaction measure showed limited social-communicative responses toward Melissa. In addition, at that same 6-week maintenance session, Melissa had the highest percentage of social-communicative responses across her baseline and maintenance probes, while Susan had the lowest percentage (but still met the SPT session goals). This suggests that Melissa engaged in social behavior toward Susan that was likely ignored and could have impacted the future likelihood of Melissa's social behavior toward Susan. Future researchers should continue to use multiple measures of changes in the siblings' interactions while ensuring that the behavior of both siblings is considered simultaneously and in the context of each other's behavior.

For both measures, there may be other more socially significant ways to define the behaviors that would provide a better indication of the overall effects of intervention on sibling interactions. For example, the definition of *talking* in the SPT curriculum did not consider the valence (i.e., positive, negative, neutral) of the statements made by the typical siblings. The social-communication responses were also not coded for valence, though this has been

considered by others. Lobato (1985) and Miller and Miller (1976) measured the valence of statements made by siblings toward each other. Similarly, Dodd, Hupp, Jewell, and Krohn (2008) measured the frequency of directions and compliments between siblings. For sibling dyads who engage in arguments (e.g., Gennifer/Robert) or siblings with ASD who emit stereotyped speech (e.g., Andrew), this additional information may be important before making confident conclusions about changes in the quality of the siblings' interactions and relationship.

Both the SPT and social communication measures may have been impacted by participant reactivity. In Zane and Andrew's case, a parent measure of how the siblings interacted in the absence of the interventionist was necessary to identify a functional change in the siblings' interactions corresponding with intervention introduction. Future researchers should continue to consider adding other measures of the sibling behavior in the absence of the interventionists to provide a more global picture of changes in siblings' behavior. Considering ways to improve upon the measures of sibling behavior and interaction are important in providing a measure of "sibling relationship". Researchers need to consider the overarching goal of positively improving the siblings' long-term relationship through involvement in typical sibling-sibling with ASD interventions.

The additional measurement of social communication responses also allowed for a comparison of typical sibling-sibling with ASD interactions to those of typically developing sibling dyads. After intervention, the typical sibling-sibling with ASD participants interacted in a more comparable way to how two typically developing siblings may interact. Using normative comparisons provides an objective measure of the significance of the intervention outcomes.

Summary

In conclusion, this study adds to the current literature with the first demonstration of acquisition of self-management and SPT responses by typical siblings of children with ASD. Self-management and SPT responses generalized across novel settings and maintained over 14 weeks. Social-communicative responses, a measure of sibling relationship, improved during siblings' interactions to a level comparable to their typically developing peers. The current study provides the promise of an empirically-supported technology (i.e., self-management) to improve the relationship between children with ASD and their typically developing siblings.

Table 1

Descriptions of Sibling Dyads

Name	Age (yrs)	Gender	CBC		SB (percentile)			ADOS			
			Clinical Subscale scores	Total Score	Non-verbal	Verbal	Full Scale	C*	S*	Lord et al., 1999	Gotham et al., 2007, 2009
Zane (TS**)	12	male	none	57	63	79	73	n/a			
Andrew (ASD)	10	male	Thought (T = 74), Attention (T = 83)	60		n/a		5	12	Autism	AUT
Susan (TS)	6	female	none	25	61	87	77	n/a			
Melissa (ASD)	12	female	Thought (T = 77)	54		n/a		8	14	Autism	AUT
Colleen (TS)	10	female	none	47	81	87	86	n/a			
David (ASD)	6	male	none	60		n/a		5	7	Autism	ASD
Gennifer (TS)	6	female	none	54	42	73	58	n/a			
Robert (ASD)	8	male	Attention (T = 88)	62		n/a		3	5	autism spectrum	AUT

*C = communication, S = social

TS = typical sibling, ASD = sibling with ASD

Table 2

Definitions of Social-communicative Responses

Target Response	Definition
Eye gaze	the eyes of one child are directed toward the face of the partner for at least 1 second
Eye contact	both child's eyes are simultaneously directed at the other child's eyes for at least 1 second
Gestures	gross motor body movement, facial expression, or posture (e.g., point, show, give, raise eyebrows, grimace, smile, look, nod, shake head)
Verbalizations	intelligible speech, including single words and multiword phrases spoken to the sibling
Joint attention responses	gaze alternation between an object, the partner, and back to the object with at least 1 second of gaze contact on each target. The discriminative stimulus was a social-communicative response by the partner within the preceding 5 seconds.
Joint attention initiations	gaze alternation between an object, the partner, and back to the object with at least 1 second of gaze contact on each target. This response chain was coded as an initiation when there was no preceding response by the partner for at least 5 seconds (i.e., partner's response was not the discriminative stimulus)

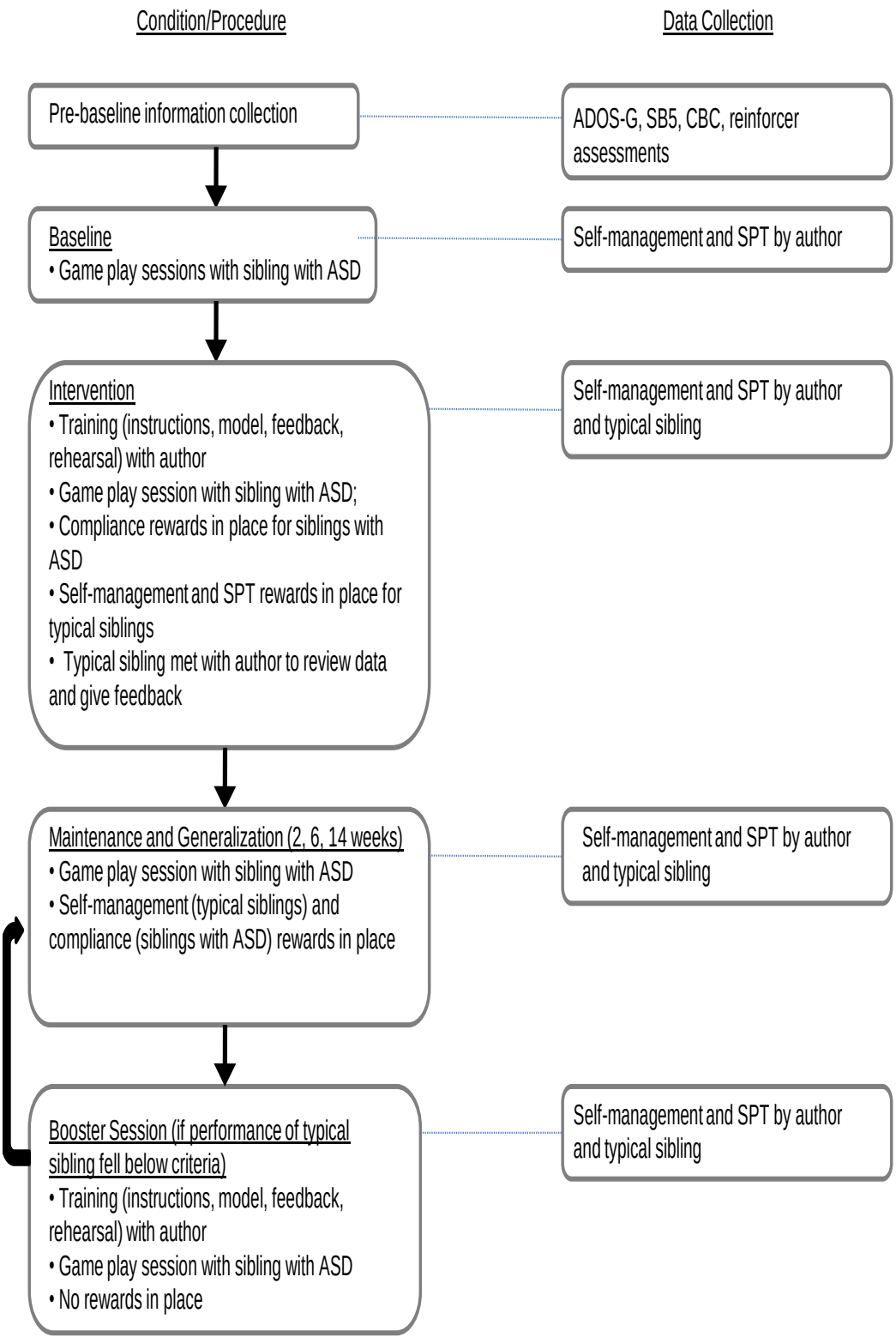

Figure 1. Flowchart of conditions, procedures, and data collection.

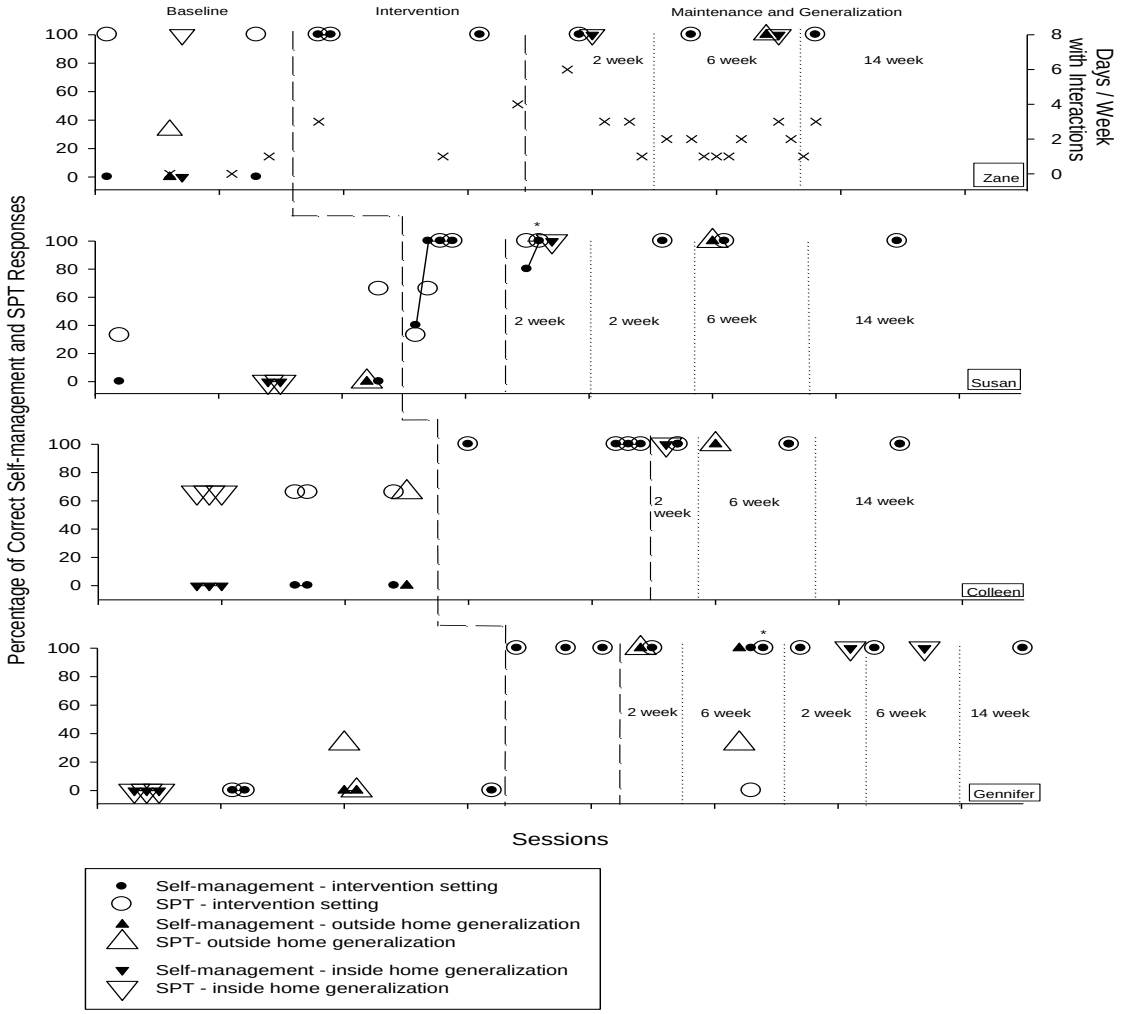

Figure 2. Responding during baseline, intervention, generalization, and maintenance sessions for typical siblings. The percentage of correct self-management responses (left axis) is represented by closed circles (intervention setting), closed upright triangles (outside generalization setting), and closed upside down triangles (in-home generalization setting). The percentage of SPT goals that met criteria each session is represented with open circles and triangles corresponding to settings described for self-management. Star above a maintenance probe indicates a booster session was administered and the maintenance schedule reset. For Zane the frequency of weekly interactions with his brother as reported by his mother is indicated by 'x' symbols (right axis).

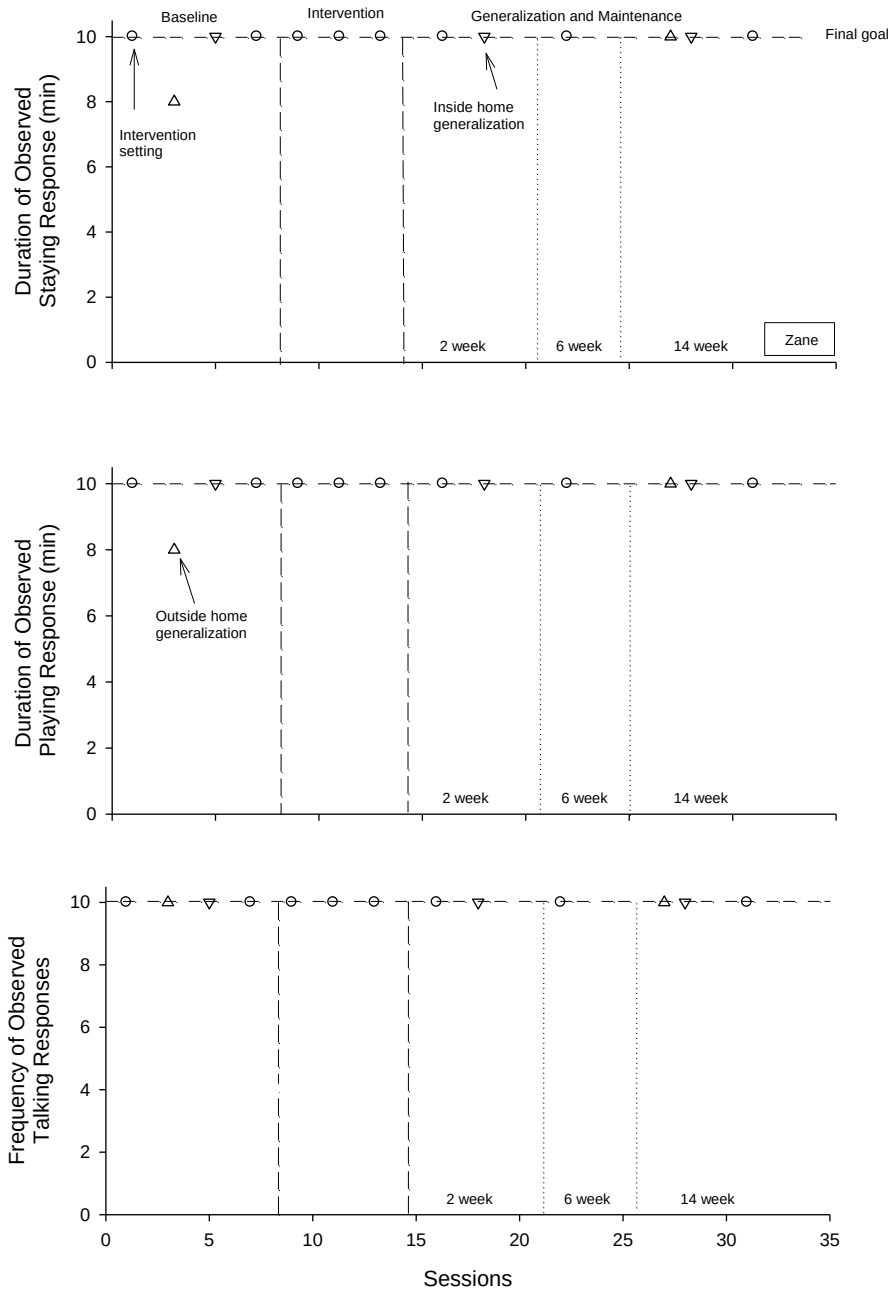

Figure 3. Stay, play, and talk observed responses (data points) in relation to final goal (dotted horizontal lines) for Zane (typical sibling). Stay-Play-Talk responses were measured in the intervention setting (circles), in-home generalization setting (upside down triangles), and outside the home generalization setting (upright triangles).

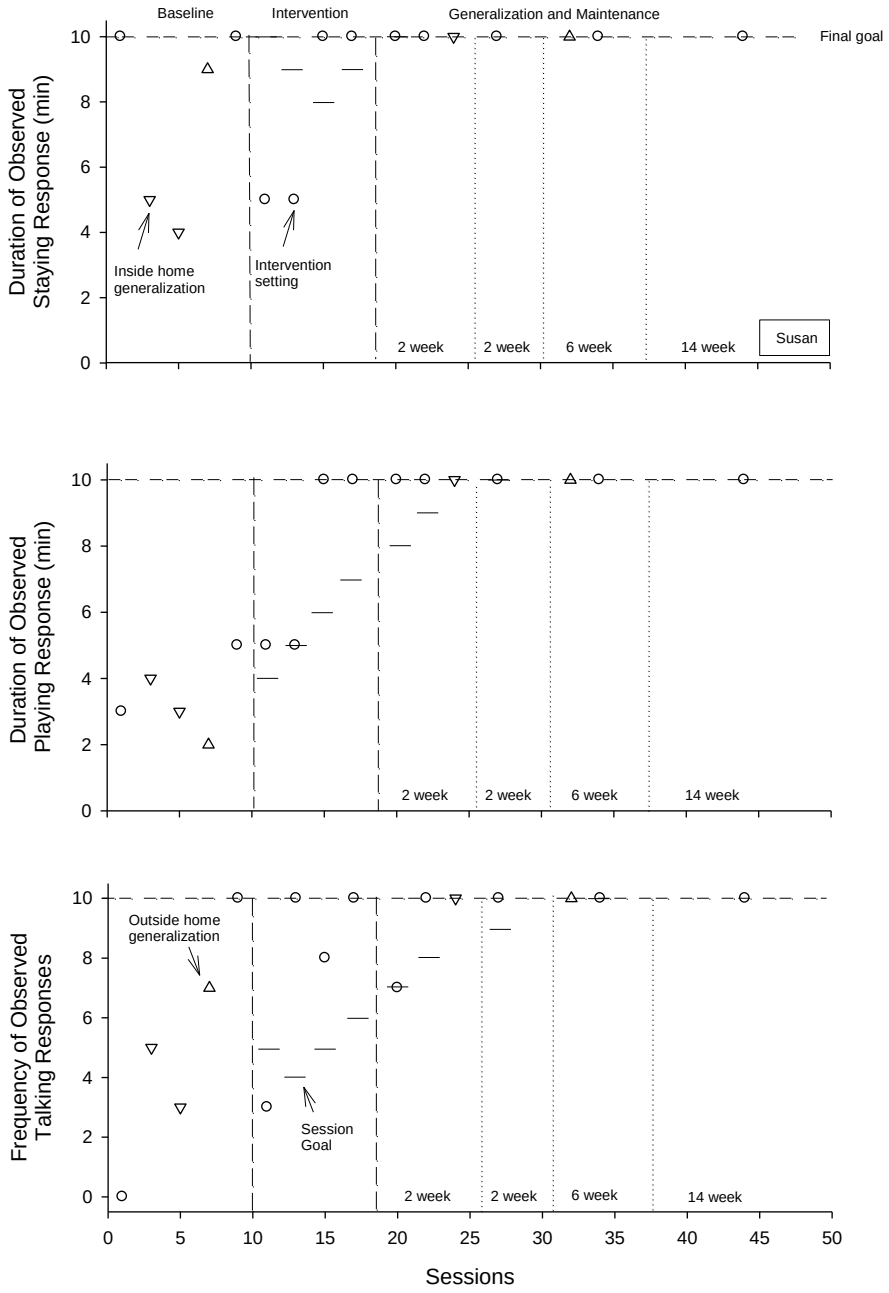

Figure 4. Stay, play, and talk observed responses (data points) in relation to session (solid horizontal lines) and final goals (dotted lines) for Susan (typical sibling). Stay-Play-Talk responses were measured in the intervention setting (circles), in-home generalization setting (upside down triangles), and outside the home generalization setting (upright triangles).

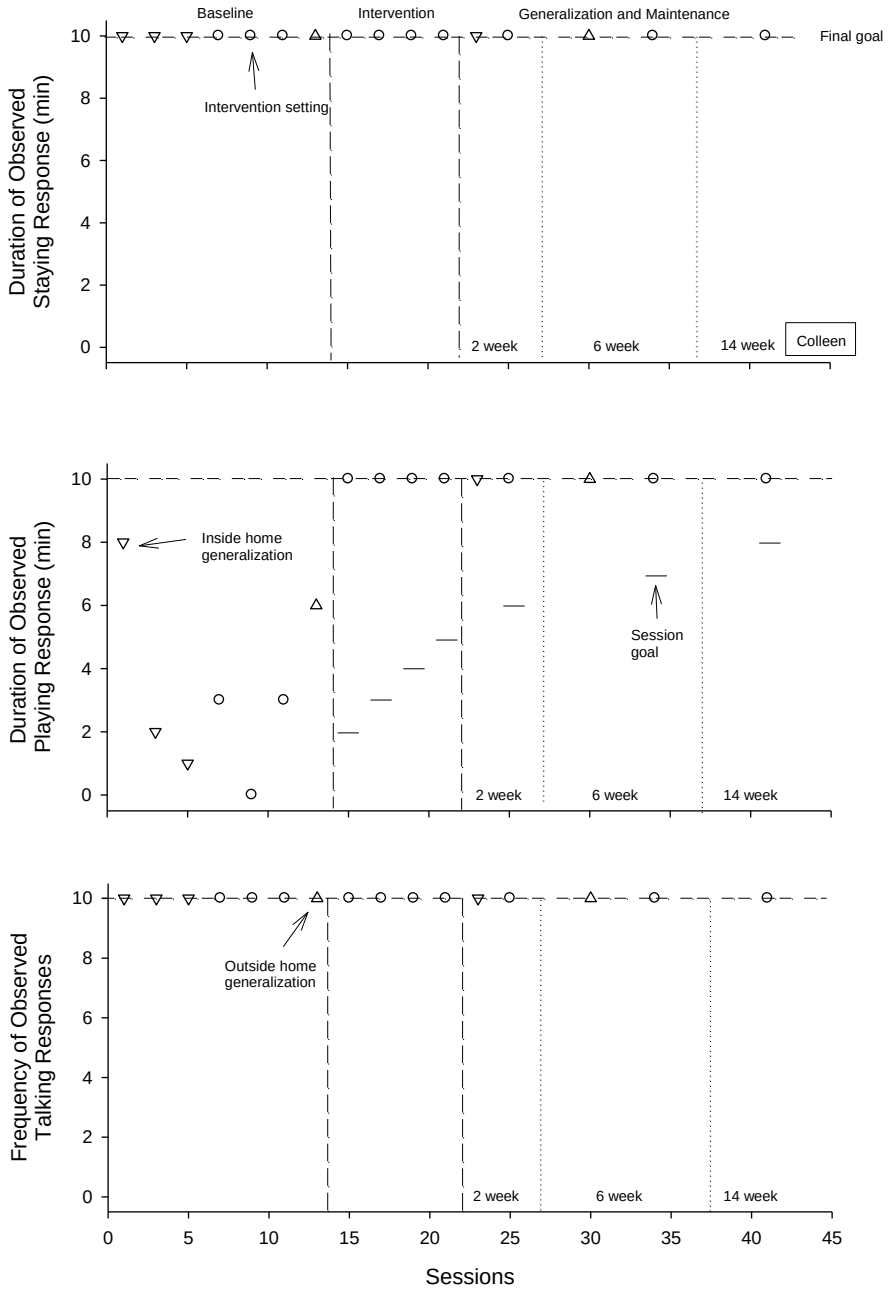

Figure 5. Stay, play, and talk observed responses (data points) in relation to session (solid horizontal lines) and final (dotted line) goals for Colleen (typical sibling). Stay-Play-Talk responses were measured in the intervention setting (circles), in-home generalization setting (upside down triangles), and outside the home generalization setting (upright triangles).

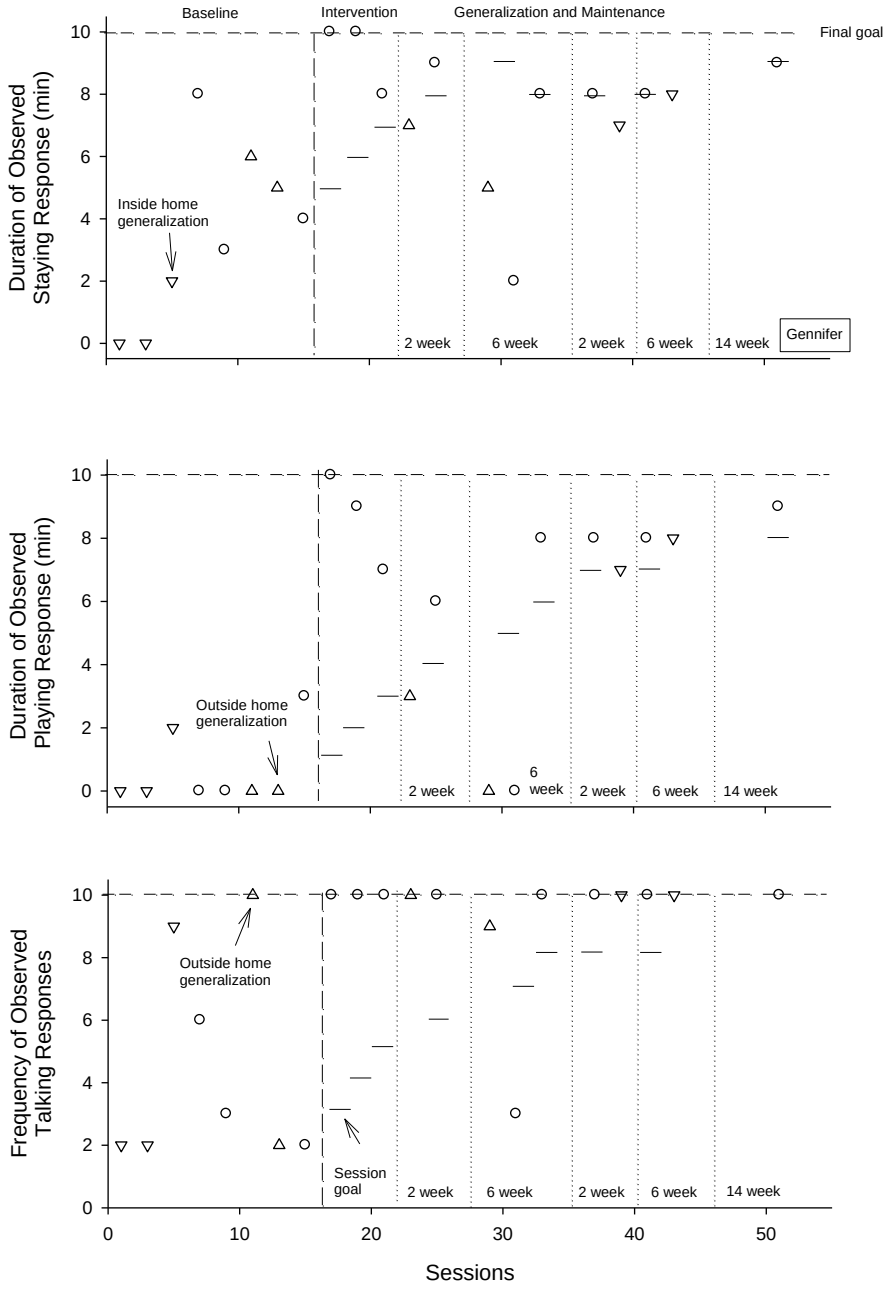

Figure 6. Stay, play, and talk observed responses (data points) in relation to session (solid horizontal lines) and final (dotted lines) goals for Gennifer (typical sibling). Stay-Play-Talk responses were measured in the intervention setting (circles), in-home generalization setting (upside down triangles), and outside the home generalization setting (upright triangles).

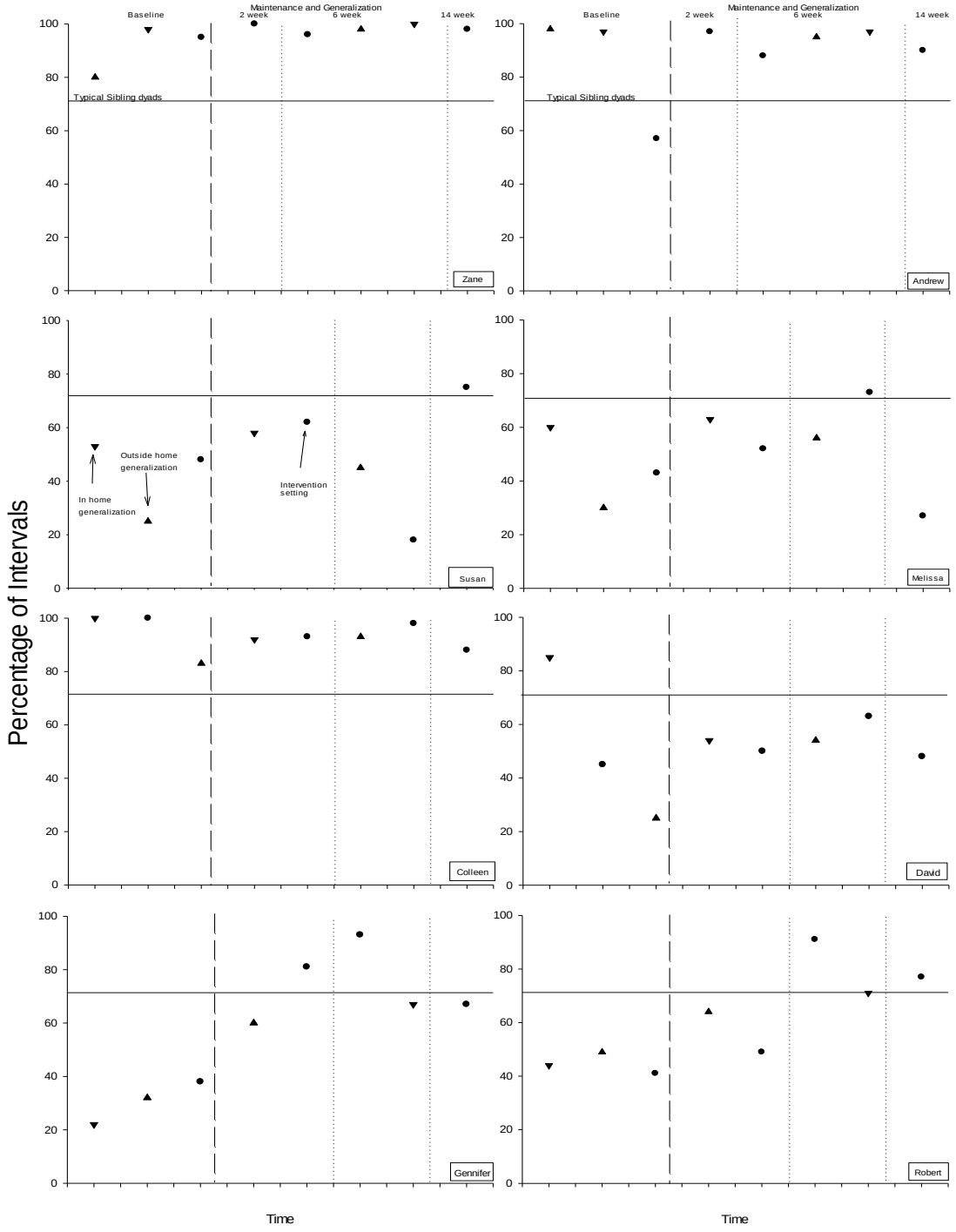

Figure 7. Percentage of intervals with social-communicative responses across baseline (circle), maintenance (circle), and in-home (upside down triangle) and outside (triangle) generalization sessions for all participants (typical siblings on left, siblings with ASD on right).

Appendix A

Modified Stay-Play-Talk curriculum

Lesson: Stay within proximity of sibling
Procedure:
Instructions
Explain the following reasons why participant should stay close to their brother/sister

- We can look at our brother/sister.
  - ✓ With our eyes
- We can talk to our brother/sister.
  - ✓ We can ask our brother/sister questions to find out what they want to do and how they want to play
- We can hear our brother/sister.
- We can play with our brother/sister.

Have participant explain in his/her own words why stay close to brother/sister (gives at least two reasons);

- If participant does not explain at least two reasons, author explains again and then asks participant to explain in their own words;
- Repeat until participant explains at least two;
- Do not move on to demonstrate until participant explains two

Modeling
Demonstrate how to stay close to brother/sister.

- Author places arms out towards participant, touch hands, and say, "I can see, talk, hear, and play with you when I am this close and even closer." Author moves away from participant with arms stretched, not touching, and say, "I can't really see, talk, hear, and play with you when I am this far away."
- Author demonstrates playing and remaining within 2 arms lengths
- Author and participant sit on the floor legs out and shows farther away
- Roll the ball back and forth to each other (between author and participant) on the floor
- Have the ball roll out of proximity and far into another direction
- Author demonstrates staying together by stating, "Let's get the ball together and come back here."
  - ✓ Tell the participant to be compliant sometimes and other times to not listen. If participant does not willingly come, demonstrate prompting:
    - Hand on shoulder,
    - Hand on arm,
    - Take participant's hand

Rehearsal and Feedback

Have participant practice moving within 2 arms lengths and staying in proximity of the author while doing different things (e.g., rolling/throwing a ball, mimic a relay race where participant and author have to get objects around the room together).

- See how participant tries to stay with author. Author should walk away from participant throughout practice. If necessary, prompt participant to make statements about saying in proximity ("Let's get the ball together and come back here").
- Practice having participant touch author on back/shoulder/arm/hand to prompt compliance.

Lesson: Playing with Siblings

Procedure:

Instructions

Explain the following reasons why participant should play with their brother/sister.

- Have fun with our brother/sister
- Learn about what they like to do
- Teach them what I like to do
- Be imaginative together
- Fun to play with other people

Have participant explain in his/her own words why stay close to brother/sister (gives at least two reasons);

- If participant does not explain at least two reasons, author explains again and then asks participant to explain in their own words;
- Repeat until participant explains at least two; Do not move on to demonstrate until participant explains two

Modeling

Practice engaging in various forms of interactions and explain to participant if you are "playing together". Provide positive and negative exemplars.

- Positive exemplars: pretend play, sharing materials, commenting on play activities, providing instructions, taking turns, working toward common goal of activity, talking with each other, looking back and forth between materials and participant.
- Negative exemplars: negative statements, physical aggression (gentle push!), playing with different materials of different activities, playing with same game but further than 1.5 meters apart, engaging in perseverative behaviors, grabbing toys away, ignoring, not looking at materials or participant, watching participant but not engaged with materials or interacting with participant, only engaging in the materials without interacting with participant.

Rehearsal and Feedback

Have participant exhibit examples of playing with the author and not playing with the author. Provide feedback as necessary.
** Embed tests of staying within proximity**

Lesson: Talking with Siblings
Procedure:
Instructions
Explain to participant purpose for talking

- When we play games with other people, it's nice when we talk to each other or show each other things. Something that happens while we play with our brother/sister can be an exciting card or move during a board game.
- Describe an "I'm excited" type of comment: An exciting card or move (doesn't have to be a move that puts someone towards winning). An exciting move can be a move in the game that causes a big change, like having to start near the beginning of the game.
- Describe an "Oh man!" type of comment: We might say "Ooh! I landed on lose a turn".
- Describe looking, pointing, showing with comments.

This helps your brother/sister know you are talking to him/her and what you are talking about.
Explain to participant why they should respond to their sibling's comments

- When we say something, lots of times someone says something back to you.
- For example, you might get a really good card and you might say "I got a great card!" and then I might say "That's awesome, Nice work!"
- When you are playing with your brother/sister, I would like you to say something back to him/her when they say something.
- By saying something back to your brother/sister, this may increase the amount of times and the different things that he says.
- This will make your game playing more fun for both of you.

Modeling
Author demonstrates how to make comments. Model playing (previous lesson), during which make at least ten comments about activities related to the game. Make sure that author's comments include looking at the participant and point/showing what comment is referring to.

- Be sure to provide varied examples.

Author demonstrates how to respond to participant's comments.

- Have participant make comments during activities. Have participant say things that their brother/sister may say (including verbal stereotypy). Provide participant with some examples of things that their sibling may say.
- When participant makes comments, make a reciprocal comment related to what he/she says. Ex. Participant says "Cool!", author says "That's awesome!"
- Be sure to make comments while looking at participant.

Rehearsal and Feedback

Have participant practice talking with author. Have participant make at least 10 comments during the game.

- Have participant make comments both about own turn, as well as author's turn ("You got two red squares!")
- Point out good demonstrations
- Explain what needs improvement and why.
- Ensure that the participant varies what they are saying, using different types of gestures, and consistently looking at partner with comments.

Author makes at least 10 comments to participant during activities. If participant does not respond with comment and simultaneous eye contact, provide immediate prompt and repeat trial. Give feedback by pointing out good responses and explain what needs improvement.

Lesson: Taking a break

Procedure:

Instructions

Explain the following reasons why and when participant should take a break from playing with her brother

- If brother yells for more than 3 sentences, hits, pushes, or throws things at you, you need to take a break so he can calm down and you don't get hurt
- No one wants to be yelled at
- Prevent feelings from being hurt
- Won't get hit or pushed
- Gives time to calm down and compromise

Have participant explain in his/her own words why taking a break is a good idea (gives at least two reasons);

- If participant does not explain at least two reasons, author explains again and then asks participant to explain in their own words;
- Repeat until participant explains at least two;
- Do not move on to demonstrate until participant explains two

Modeling

Demonstrate how to take a break.

- Author tells participant to remember the last fight she had with her brother
- Author tells participant to yell like she did during that fight
- Author says "let's take a break" and increases distance to across the room. She looks at the time to see how long she has left to meet SPT goal
- Author stays across room for 5 minutes
- Author approaches participant and says "do you want to keep playing?"

- Author has participant say “yes” and “no” across 2 trials to practice both scenarios
- If participant says “no”, author says “OK” and walks away and completes self-management checklist
- If participant says “yes”, author says “thank you for still playing” (or similar behavior-specific praise), continues to play until SPT goals are met

Rehearsal and Feedback

Have participant practice taking a break

- See how she responds to both “yes” and “no” responses about continuing to play after break
- Make sure she does not interact with sibling during the break
- Be sure she can complete self-management checklist and keep track of SPT goals during break time

Appendix B

Data Sheet for Author to Record Self-management and SPT Responses by the typical sibling

Participant Initials:		
Date		
1) Set SPT goals?		
Goals: Stay: Play: Talk:		
2) Identify reward for meeting SPT goals		
Reward:		
3) Record SPT responses		
4) Compare SPT responses to goals		
Meet Stay goal?		
Meet Play goal?		
Meet Talk goal?		
Meet all SPT goals?		
5) Determine if met criteria to obtain reward		
Met criteria?		
6) If applicable, recruit reinforcement from parent		
Obtain reward?		
Notes:		

* Items 1-6 were used to calculate typical sibling's engagement in target responses

Appendix C

Data Sheet for Typical Sibling to Self-record SPT Responses

1) Did I set goals?	Y	N
Write goals: I will stay with _____ for _____ minutes. I will play with _____ for _____ minutes. I will talk _____ times.		
2) Did I choose a reward for meeting the goals?	Y	N
Write reward:		
How long did I stay with _____?	_____ mins	
How long did I play with _____?	_____ mins	
How many times did I talk to _____?	_____ times	
3) Did I meet the goals?	Y	N
4) Did I show mom/dad to get my reward?	Y	N

Appendix D
Intervention Integrity Data Sheets

Baseline Data Sheet Record +/-/NA	Initials: Date: Video clip:
1) Place self-management forms on a table	
2) Have siblings play together	
3) Do not provide prompts during sibling interaction	
4) No scheduled consequence after interaction	
5) Intervenes with challenging behaviors > 30 seconds (if applicable)	

Intervention Data Sheet: Record +/-/NA	Initials: Date: Video clip:
1) Review self-management task analysis	
2) Explain SPT response	
3) Model SPT and self-management responses	
4) Participant to practice SPT and self-management responses with author	
5) Author provide praise for correct responses	
6) Author provide corrective feedback for incorrect/omitted responses (if applicable)	
7) Have siblings play together	
8) Do not provide prompts during sibling interaction	

9) Compare typical sibling and author's data and give feedback	
10) Give points to siblings (if applicable)	

Generalization and Maintenance Data Sheet Record +/-/NA	Initials: Date: Video clip:
1) Place self-management forms on a table	
2) Have siblings play together	
3) Do not provide prompts during sibling interaction	
4) No scheduled consequence after interaction (before intervention) 4b) Reward consequences after interaction (after intervention)	
5) Intervenes with challenging behaviors > 30 seconds (if applicable)	

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