SIBLING USE OF RESPONSIVE INTERACTION STRATEGIES

ACROSS SETTINGS

By

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Dissertation

Submitted to the Faculty of

Graduate School of Vanderbilt University

in partial fulfillment of the requirements

of the degree of

DOCTOR OF PHILOSOPHY

in

Special Education

May, 2006

Nashville, Tennessee

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To my mom and dad, I couldn't have done it without you.

ACKNOWLEDGEMENTS

TABLE OF CONTENTS

Appendix

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Strategies to Support Social Interactions

Children with developmental disabilities are often delayed in the development of

social interaction skills, prerequisite for communicating with others. Typically,

individuals develop these skills through naturally occurring events that take place

throughout infancy and the early childhood years. Children with well-developed

communication skills have numerous opportunities to engage in social interactions. They

receive feedback on their attempts to initiate and respond during those interactions with

both peers and adults. Opportunities to engage in social interactions may take place in

young children's homes, in their classrooms, and community settings. Children with

developmental delays, however, are often unable to engage effectively in social

interactions due to their limited initiation and response skills (Girolametto, 1988). Thus,

it may be important to create more frequent opportunities for these children to participate

in social interactions and to support them in their interactions.

Siblings as Social Interaction Partners

Typically developing siblings may provide opportunities for their brothers and

sisters to participate in social interactions. Research on typically developing sibling dyads

suggests that brothers and sisters often learn social and communicative behaviors from

each other (Abramovitch et al., 1986). Older siblings of children without disabilities often

assume roles that involve teaching their younger siblings specific behaviors during interactions (Minnet, Vandell, & Santrock, 1983; Stoneman, Brody, & MacKinnon, 1986) and younger siblings often imitate the behavior of their older siblings (Abramovitch et al., 1986).

Research describing sibling interactions when one sibling has a disability is somewhat limited. The available research suggests that typically developing siblings frequently assume roles involving caretaking, managing, and helping their siblings with disabilities during interactions rather than assuming roles that reflect equal participation by each partner (e.g. playmate) (Stoneman, Brody, & MacKinnon, 1986; Stoneman, Brody, Davis & Crapps, 1988; Stoneman et al., 1989). Sibling pairs in which the younger child has a disability tend to exhibit greater role asymmetry than sibling dyads that do not include a child with a disability (Stoneman et al., 1989). During play interactions, children with disabilities and their typically developing siblings tend to assume playmate roles significantly less often than sibling pairs in which both children are typically developing. Furthermore, older siblings of children with disabilities engage in twice as many managing, helping, and teaching interactions as older siblings of children without disabilities. In summary, sibling pairs in which the younger child has a disability tend to exhibit greater role asymmetries than matched sibling dyads that do not include a child with a disability (Stoneman et al., 1989). Responsive interaction interventions have been shown to support the social and communicative behaviors of children with disabilities and to facilitate more symmetrical interactions between siblings and their brothers and sisters with disabilities (Trent et al., 2005; Trent et al., 2006).

Interventions to Support Social Interactions

Responsive Interaction (RI) strategies are a set of strategies designed to promote social interaction and engagement between young children with developmental delays and their interaction partners (Weiss et al., 1981; Girolametto, 1988). RI interventions include a set of strategic behaviors intended to maintain a child's interest in conversations and to provide models of context appropriate language and communication skills. When an conversational partner follows the lead of the less skilled speaker, allows him or her to define the topic of conversation, balances turns between the conversation participants, and responds communicatively to the speaker's verbal and nonverbal intentions, young children with disabilities have more opportunities to participate in the ongoing interaction (Kaiser & Goetz, 1993).

Parents as Interventionists

Research suggests that parents of children with developmental delays can learn to implement RI strategies in interactions with their children. Teaching parents to use RI strategies helps them become more responsive and less dominant and directive during interactions with their children. For example, mothers who receive training in RI strategies typically demonstrate an increase in contingent turns, an increase in semantic feedback, and a decrease in re-directive turns during interactions with their children (Girolametto, 1988; Kaiser et al., 1996). Parents, however, are not the only family members in the lives of children with disabilities and are capable implementers of intervention strategies. The role of siblings as interventionists is discussed below.

Siblings as Interventionists

Siblings of children with disabilities have not been a major focus of intervention research. There are a few studies, however, in which typical siblings have been taught strategies to support learning by their brothers and sisters with disabilities. Communication and social interaction skills have been targeted in several studies (Celeberti & Harris, 1993; James & Egel, 1986; Hancock & Kaiser, 1996; Tekin & Kircaali-Iftar, 2002; Trent et al., 2005; Trent et al., in press). Siblings of children with a variety of disabilities have learned how to use direct prompting strategies to increase reciprocal interactions (James & Egel, 1986), to deliver play-related commands and social praise (Celiberti & Harris, 1993), to use modeling and mand-modeling procedures (Hancock & Kaiser, 1996), and to use constant time delay and simultaneous prompting procedures (Tekin & Kircaali-Iftar, 2002). In each of these studies, the typically developing siblings were able to demonstrate correct use of the intervention strategies following training and instruction from an adult investigator.

Positive changes in the behavior of the siblings with disabilities also have been demonstrated in the sibling intervention studies. For example, following intervention, siblings with disabilities used specific vocabulary targeted during intervention (Celiberti & Harris, 1993; Hancock & Kaiser, 1996; Tekin & Kircaali-Iftar, 2002). The siblings with disabilities also demonstrated increases in their rates of initiations during sibling interactions following participation in sibling implemented interventions (James & Egel, 1986; Hancock & Kaiser, 1996). Results of theses studies support the hypothesis that siblings of children with disabilities are capable of learning to implement intervention strategies, that younger siblings with developmental disabilities respond positively

4

interventions implemented by their older siblings, and that the older siblings enjoyed participating in the intervention.

One concern with involving typically developing siblings in the interventions describe above is the possibility that it might exacerbate the role asymmetry between siblings. Each of the interventions outlined above involves placing the typical sibling in a teaching role rather than encouraging more equal roles for both siblings. Teaching siblings to use responsive interaction strategies with their younger siblings may be one way to support children with disabilities without placing the typical siblings in a teaching role.

Siblings' Use of Responsive Interaction Strategies

Siblings have been taught to implement responsive interaction (RI) strategies with their younger siblings with disabilities (Trent, Kaiser, & Wolery, 2005; Trent, Kaiser, & Frey, in press). In these studies, the effects of an intervention designed to facilitate interactions between older typically developing siblings and their younger siblings with disabilities were investigated using a multiple baseline design across behaviors and participants. The Trent et al. (2005) study included two sibling dyads and the Trent et al. (in press) study included three sibling dyads. In these two studies, typical siblings were taught to use two RI strategies, mirroring and verbal responding, through the use of written materials, modeling, role-play, and verbal feedback.

The RI intervention was adapted from the procedures used in previous studies with parents (Kaiser & Delaney, 1998; Kaiser, Hancock, & Hester, 1998). Two core features of RI, nonverbal mirroring and verbal responding, were selected for intervention

5

because they are foundational strategies for promoting reciprocal interactions and could be learned easily by older, 8 to 12 yr old, children. Mirroring, defined as the contingent imitation of nonverbal behavior, requires the older sibling to attend to and engage in the nonverbal behaviors of the sibling with a disability. When using mirroring, the older siblings may be more likely to make activity-relevant comments and contingent responses because their attention is focused on the actions of their younger siblings with disabilities. Verbal responding consists of verbal responses to acts of intentional communication performed by the siblings with disabilities. Verbal responding facilitates the older child's contingent responsiveness to the child with a disability and provides opportunities for the child with a disability to initiate and respond in the context of verbal turn-taking.

In the first RI study (Trent et al., 2005), typically developing siblings learned the RI techniques quickly and used them in play interactions with their younger sisters with Down syndrome. Following training in the two RI strategies, both typical siblings increased their use of mirroring and verbal responding during play interactions. The measures of communicative performance of the children with disabilities revealed modest effects on the verbal behaviors of the siblings with disabilities. Siblings with disabilities demonstrated variable improvements in topic-related verbal turns, MLU, diversity of vocabulary, and percentage of initiations from baseline to the end of the intervention. Generally, changes in the typical siblings' use of RI strategies and the verbal behaviors of the siblings with disabilities were maintained at the 1-mo follow-up assessment in both dyads. Generalization was not assessed in this study.

The second sibling study (Trent et al., in press) was a replication and extension of the first study. In the second study, generalization of intervention effects was assessed during snack time. All three typical siblings learned the RI techniques and used them during play interactions with their younger siblings with disabilities. Children with disabilities increased their number of comments. Generally, changes in the typical siblings' use of RI strategies and the verbal behaviors of the siblings with disabilities were maintained at the 1-mo follow-up for all three dyads.

The effects of the intervention in the play setting did not generalize readily to the snack setting. Sibling interactions during generalization sessions were positive, but the siblings assumed very asymmetrical roles. The siblings with disabilities needed assistance preparing their own snacks. Therefore, the typical siblings usually assumed the role of a teacher or helper, instructing the siblings with disabilities to prepare the snack rather than being responsive to their brothers' and sisters' acts of intentional communication. Such behavior is not completely unexpected given typical siblings often have a history of assisting their brothers/sisters with disabilities when they are having difficulty completing a task.

Promoting Generalization

The previous two RI studies leave an important question unanswered. That is, what intervention strategies might facilitate the ability of typical siblings' to generalize the use of RI strategies to settings other than the training setting. Generalization of RI strategies by typically developing siblings is important for maximizing the effects of the intervention for both the typical siblings and their brothers and sisters with disabilities.

Sibling interactions are not limited to play interactions. It is likely that siblings spend time together in a variety of play activities and daily routines. Thus, implementing RI strategies in only one context may not be sufficient to facilitate generalized improvements in sibling reciprocity.

Further, implementation of RI in only one context is unlikely to effect change in the communicative skills of the siblings with disabilities. If typical siblings learn to use RI strategies in multiple contexts, the siblings with disabilities have increased opportunities to practice social and communicative skills with a responsive interaction partner and to practice these skills in more than one context. Finally, because the verbal behaviors of the typical siblings are likely to vary by context, typical siblings' use of RI strategies in a variety of contexts provides the children with disabilities multiple exemplars of verbal and nonverbal communication. Presenting multiple exemplars of verbal behaviors to children with emerging communication skills facilitates their communicative development across skills and contexts.

General-case Programming

Given the importance of the generalization of intervention effects, it is necessary to consider how to promote generalization. To promote generalization across settings, the language taught to or modeled for children should include the vocabulary and syntactic combinations that are most functional to the children in those settings. For example, if meal times are determined to be an important setting for children to be able to communicate, language interventions should take place within that setting. Further, children should be presented with multiple contexts within which to practice

communication and interaction skills. Children are unlikely to generalize newly acquired skills if they are only practiced in one setting. Programming for the intervention to take place in multiple settings provides the child with a disability with a variety of situations in which to practice social and communication skills and a variety of context specific language modeled by the interaction partner.

The idea of conducting language interventions in the settings that are important to individual children is taken from the general-case programming method (Horner & Albin, 1988). Research on general-case programming suggests that teaching should take place within settings/events that are functional for individuals. A primary component of general-case programming is the instructional universe that is selected for the individual child. The instructional universe defines the behaviors the learner needs to perform in certain environmental conditions or settings. The instructional universe varies across levels of language skills. For example, if presented with a preschool-age child with mental retardation, it would not be functional to teach or model vocabulary necessary to buy groceries. In contrast, it would be functional to model or teach the vocabulary needed to participate in a meal or art activity at school to a pre-school-aged child with severe mental retardation. Thus, in RI, the instructional universe should be those settings in which the interventionist intends to promote change between the child with a disability and the interaction partner.

The assumptions about learning that are put forth by general-case programming are applicable to teaching siblings to use responsive interaction strategies with their brothers and sisters with disabilities. First, it is important to select training contexts that are functional for both children in the sibling dyad. In the present study, siblings

participated in activities from three different contexts, social toys, independent toys, and shared-product routines. These contexts were selected because they were contexts in which siblings routinely participated but did not frequently communicate. Teaching typical siblings to use RI strategies in settings that are familiar and functional to both of them increases the probability that the behaviors will generalize.

Second, implementation of RI strategies in functional settings and activities increases the probability that the communicative behaviors acquired by the siblings with disabilities will generalize. In the RI intervention, typical siblings are not taught to elicit language or to explicitly instruct their younger brothers and sisters. During implementation of RI strategies across multiple settings, however, they are more likely to model verbal behaviors appropriate to the current, functional contexts. When language models are functional for the child and the context, they are more likely to be acquired and generalized to other contexts in which the language is functional. In the current study, siblings participated in three different activities within each of three different contexts (i.e., social toy activities, independent toy activities, and shared-product routines). Thus, siblings interacted in nine different activities providing the children with disabilities a variety of context specific models.

Support Strategies

Another strategy for supporting generalization is specific to the typical siblings. For the typical siblings, it is necessary to consider the level of support needed to promote generalization of RI strategies (Stokes & Baer, 1977). In the previous research on sibling generalization of RI strategies (Trent et al., in press), typical siblings were not given any

10

instructions, coaching, or feedback regarding their use of RI strategies in contexts outside

of the training context. It may be unreasonable to expect children to generalize newly

acquired behaviors across settings without some level of instruction. In an attempt to

better understand the level of support and training needed to support generalization, the

current study included a plan for two levels of support. First, siblings were reminded to

use the RI strategies during each generalization activity. If the reminder alone was not

effective for promoting generalization, the typical siblings were provided with explicit

instructions about how to use the RI strategies in other contexts as well as feedback

regarding their performance in these contexts.

Purpose of Study

The primary goal of this study was to teach generalized use of RI by typical

siblings. Results of the previous two studies on siblings' use of RI strategies suggest that

siblings can learn to implement this intervention with their younger brothers and sisters

with disabilities (Trent et al., 2005; Trent et al., in press). Thus, the focus of the current

study was on promoting generalization of RI strategies to contexts other than the training

context.

In the current study, siblings were taught to use RI strategies in a social toy play

context. Generalization to activities in two additional contexts, independent toys and

shared-product routines, was assessed throughout baseline and each phase of

intervention. Initial programming for generalization consisted of a reminder to use the RI

strategies prior to the start of each generalization activity. It was hypothesized that the

reminder alone might be sufficient to promote generalization of typical siblings' use of

RI strategies to contexts outside of the training context. If the reminders were not sufficient to promote generalization, a secondary program to promote generalization involving explicit instruction and feedback across settings was implemented.

Research questions addressed in the current study included the following: 1) can older siblings of children with disabilities learn to use RI strategies in the primary intervention context; 2) does older siblings' implementation of RI strategies affect the communicative performance of their younger siblings with disabilities; 3) can older siblings learn to generalize use of RI strategies to two generalization contexts, independent toys and shared-product routines; 4) does older siblings' generalized implementation of RI strategies affect the communicative performance of their younger brothers and sisters in generalization contexts? A fifth question addressed following completion of the study was whether a sequential relationship between the behaviors of the typical siblings and the siblings with disabilities developed across the intervention phases.

CHAPTER II

METHOD

Participants

Three sibling dyads were recruited through the local Down Syndrome Association

of Middle Tennessee, Autism Society of Middle Tennessee, Vanderbilt Kennedy Center's

Study Finder, an online resource for families of children with disabilities, and informal

contacts with parents of children with disabilities who had participated in an ongoing

language intervention project at Vanderbilt University. To participate in the study, typical

siblings had to be: (a) between 7 and 12 years of age, (b) chronologically older than the

siblings with disabilities, (c) willing to participate in the study, and (d) sign an assent

form. The siblings with a disability had to be: (a) between the ages of 4 and 11 years, (b)

chronologically younger than their typical siblings, (c) have significant language delays,

and (d) have at least 10 productive vocabulary words. Language abilities were confirmed

through administration of the PPVT and a collection of a language samples prior to the

start of baseline. Parents were interviewed informally about the relationship between their

children. Written consent for their own and their children's participation in the study was

obtained from the mothers of each sibling dyad.

The typical sibling in Dyad 1, TS1, was 12 years of age at the onset of the study,

in the 7th grade, and home-schooled by his mother. His younger brother with Down

syndrome, DS1, was 10 years of age and attended a public elementary school. At the pre-

baseline assessment, DS3 had an MLU of 1.76 and a PPVT score of 83. Dyad 1's parents

were college graduates who owned their home in a suburban area of Nashville. The mother was a full-time homemaker and the father worked full-time for a car company. A summary of participant characteristics can be found in Table 1.

The typical sibling in Dyad 2, TS2, was 8 years of age, in the 3rd grade, and home-schooled by her mother. Her younger brother with Down syndrome, DS2, was 6 years of age and attended a private preschool program. DS2 had an MLU of 1.09 and a PPVT standard score of 40 at the beginning of the study. The family owned their home in a suburban area near Nashville. The mother was a full-time homemaker and the father did custodial work for a church. An infant sister was the 3rd child in the family.

The typical sibling in Dyad 3, TS3, was a 10 year old female attending the 5th grade at a public elementary school. Her younger brother with autism, DS3, was 4 years of age and attended a public school five days each week during the school year. DS3 received speech therapy throughout the study. A baseline assessment of MLU indicated that DS3 had an MLU of 2.20 and PPVT score of 83. Dyad 3's married parents rented a home in a suburban area in Nashville. The mother worked part-time for a security company and the father worked full time for a local plant. There were two additional children in the family, including a 3 yr old female and a 3 yr old male with autism; these two siblings were twins.

Table 1

Characteristics of the Typical Siblings and Siblings with Disabilities at Baseline

	Typical Sibling 1	Sibling with Down syndrome 1	Typical Sibling 2	Sibling with Down syndrome 2	Typical Sibling 3	Sibling with Down syndrome 3
Age (years)	12	10	8	6	10	5
Academic Grade	Home-school program	4th	Home-school program	Pre-school	5th	Pre-school
Gender	Male	Male	Female	Male	Female	Male
*PPVT	-	83	-	40	-	83
**MLU	-	1.76	-	1.09	-	2.20
Diversity	-	67	-	24	-	97

- *Scores on the PPVT are standard scores
- ** Based on a 20 min language sample conducted by the interventionist

The interventionist was a 5th year doctoral student in early childhood special education with over four years of experience implementing milieu language teaching procedures with young children and working with siblings of children with disabilities.

Settings and Materials

All observation and training sessions were conducted in the homes of the participants. In-home training was chosen to support generalization and maintenance of acquired interaction skills. Each observation was recorded using a digital video camera. Observations during baseline and RI training were conducted in a room selected by the children. Each session lasted approximately 45 minutes. A 5-10 min play segment of

each session was videotaped. Attempts were made to make the rooms used for observations constant throughout the study. Televisions and radios were turned off, and the siblings were asked to remain in the room they had selected during the sessions. Parents and other siblings were asked to stay out of the room during training sessions. Within the selected room, a space was designated by the investigator for the siblings to play. The play space was arranged to minimize the risk of the sibling with a disability leaving the interaction. The space also was arranged so the siblings could be in close proximity to one another.

During baseline and RI training sessions, children played with social and/or pretend play toys provided by the investigator or toys that were already available in the family's home (Table 2). Toys and activities were selected from a sibling toy preference assessment administered prior to the start of baseline to determine what toys or activities both the typical sibling and sibling with disabilities enjoyed (Appendix A). Toys and activities for the RI training sessions had to meet the following criteria: 1) allowed for two participants to play, 2) were non-competitive in nature (e.g. no board games, video games, or card games), 3) could be used in the designated play area, 4) had at least two of each toy so both siblings could have a toy, and 5) fit into the social or pretend play category of activities (Table 2). Examples include dramatic play activities like veterinarian, farm, army men, and construction. Only the two children and the interventionist were present in the selected room during experimental sessions.

Table 2

Training and Generalization Contexts

Intervention Context: Social/Pretend Play Activities	Generalization Contexts:	
	Independent Activities	Shared-product Activities/ Household Routines
• Dress-up,	• Play dough	• Preparing a snack
• Dolls/dollhouse	• Books	• Making a craft
• Housekeeping	• Paints/paintbrushes	• Variations of the two
• Pretend food	• Paper w/ scissors and/or markers	• Set the table
• Veterinarian	• Peg boards	• Clean-up toys
• Doctor	• Ball chutes	• Laundry: put in; take out
• Construction	• Shape sorter	• Dishwasher: put dishes in, take dishes out
• Farm	• Puzzle	• Wash and dry dishes in sink

Observations and training sessions for generalization training and probes were conducted in the rooms where the selected activities typically took place (i.e., washing dishes occurred in the kitchen). Again, televisions and radios were turned off and the siblings were asked to remain in the room until the activity was completed. Parents and other siblings were asked to stay out of the room during these sessions. Activities were selected from two generalization contexts: 1) independent toys and 2) household routines/shared-product routines. These contexts were selected because they were natural contexts for siblings to spend time together. Duration of each generalization session varied by activity and ranged between approximately 2 and 7 minutes.

<center>Response Definitions and Measurement</center>

Typical Siblings

The typical siblings were taught three RI strategies, mirroring, nonverbal turn-taking and verbal responding (See Table 3). During mirroring training, the typical siblings were taught to imitate the appropriate nonverbal behaviors of their siblings with a disability. During nonverbal turn-taking training, siblings were taught to take nonverbal turns within play and activity routines. For responding, siblings were taught to verbally respond to both verbal and nonverbal acts of intentional communication performed by the siblings with a disability. To simplify the intervention for the typical siblings, they were taught to respond to the following overt acts of intentional communication: 1) verbalizations by the sibling with a disability directed toward the typical sibling, 2) attempts by the child with a disability to show the typical sibling something by pointing

<center>18</center>

to an object or event, 3) attempts by the child with a disability to give the typical sibling

an object, and 4) attempts by the child with a disability to communicate using sign

language. Additional, less overt acts of intentional communication (i.e. smiles, reaches)

by the siblings with disabilities were coded and counted as communication attempts but

the typical siblings were not expected to respond to them.

Table 3

Typical Sibling Behaviors

Behavior	Definition	Examples
Mirroring	- Contingent imitation of DS - Same object, same action - Simultaneously or immediately following the behavior of DS	DS cuts playdough with scissors; TS cuts playdough with scissors
Nonverbal Turn-taking	- Taking a nonverbal turn following a nonverbal turn taken by the DS - Same object, different action - Different object, same action	- DS cuts playdough with scissors, TS cuts play dough with a knife - DS rolls playdough into a ball, TS smashes playdough onto table
Verbal Responding	- Verbal response to verbal and nonverbal acts of intentional communication by DS - Repeating any part of what the sibling with a disability says - Verbally commenting on the activities in which the two siblings are participating - Pausing for at least 5s after each verbal turn	- DS says "ball", TS says "ball" - DS says "ball", TS says, "we're playing ball"

Sibling with Disabilities

The primary measure for the siblings with disabilities, intentional communication, was divided into two pragmatic categories: (a) comments and (b) requests (See Table 4). Acts of intentional communication include acts that require coordinated attention (i.e., non-word vocalizations, reaches, claps, smiles, contact points, and touching the older sibling) and acts that do not require coordinated attention (i.e. referential words or signs, conventional gestures, giving, showing, extending and upturned palm to older sibling, distal points, or moving the older siblings hand to an object).

Table 4

Behaviors of the Siblings with Disabilities

Behavior	Definition	Examples
Comments	• Verbal or nonverbal • Intent to direct TS attention, share positive affect, or share interest	• Verbally commenting on the activity • Pointing to an object or event to show TS
Request	• Verbal or nonverbal • Intended to request an action, object, help, comfort, or a label	• Verbal question like "what happened" • Handing TS a box to help open

Interventionist

Throughout the intervention, the interventionist was present to provide prompts to the typical siblings when necessary (See Table 5). Prompts consisted of verbal directives spoken aloud and were limited to two prompts per minute for a maximum of 10 prompts per 5 min session. Interventionist use of prompts were coded throughout the intervention

20

and the interventionist faded prompts as the siblings became more proficient at using the

RI strategies. Praise for correct use of the intervention strategies was also used

throughout the intervention sessions. Praise statements were limited to 2 statements per

minute for a maximum of 10 praise statements per 5 min session. The typical siblings and

the siblings with disabilities were compensated for their participation in the study with

weekly prizes that were selected from a prize bag (e.g., stickers, art supplies, candy).

Table 5

Interventionist Behaviors

Behavior	Definition	Examples
Prompts	• Used to remind siblings to mirror and/or verbally respond • Suggestions of ways to mirror and verbally respond	• Prompt siblings to play with a toy • Prompt siblings to sit in closer proximity • Prompt to switch activities when the siblings were not engaged in the current activity
Praise	• Comments to provide praise to the siblings for appropriate behavior • To indicate approval of the behavior	• "Great job mirroring" • "You're doing a good job responding to everything"

Measurement

Three classes of behavior were measured using the Sibling Interaction Code

(Trent, 2006) created by the first author: (a) use of RI strategies by the typical siblings,

(b) acts of intentional communication by the siblings with disabilities, and (c) verbal

prompts and praise provided by the interventionist during training sessions. Specific codes for the acts of intentional communication by the siblings with disabilities were adapted from a code created by Yoder (2005). Additional measures included a sequential analysis for matched turns between the siblings with disabilities and the typical siblings.

Observational data were collected on all siblings' behaviors by coding the videotapes of individual sessions. Videotapes were viewed and scored using ProcoderDV (Tapp, 2003). Continuous event recording was used to measure all except for mirroring and nonverbal turn-taking. Partial interval sampling with 10-s intervals was used to measure mirroring and nonverbal turn-taking due to the difficulty in segmenting these behaviors. ProcoderDV (Tapp, 2003) was used to code sessions and MOOSES (Tapp, 2003) was used to summarize rates of responding (following a turn by the sibling with disabilities or a 5-s pause) by the typical siblings, rates of acts of intentional communication by the siblings with disabilities, rates of training and praise by the interventionist and the duration of mirroring/nonverbal turn-taking throughout each RI training session.

Interobserver Agreement

Two coders were trained using videotapes from previous studies prior to the start of the current study. Coders practiced coding the tapes until 80% Interobserver Agreement (IOA) was obtained and maintained for three consecutive training sessions. Interobserver agreement was assessed by comparing data coded by the coders in training with data coded by the principal investigator. IOA was assessed on eight behaviors: (1) typical siblings' use of mirroring 2) typical siblings' use of nonverbal turn-taking, (3)

22

typical siblings' use of repeating, (4) typical siblings' use of describing, (5) comments made by the siblings with disabilities, verbal and nonverbal, (6) requests made by the siblings with disabilities, verbal and nonverbal, (7) investigator prompts, and (8) investigator praise. Percent agreement was calculated by checking agreement and disagreement for each interval and event.

Interobserver agreement (IOA) data were collected on coded behaviors of the typical siblings, siblings with disabilities, and the investigator throughout the study. IOA was collected in each setting, baseline, training, and generalization settings. A trained observer watched and coded data from the videos of all experimental sessions for all three dyads. IOA was assessed on 33% of the baseline and intervention sessions for each dyad by having a second observer independently code the tapes. The records of the two observers were compared for exact agreement. For behaviors measured with event recording, an agreement was scored for each behavior category coded by both observers within a 5 s window. A disagreement was scored when a behavioral category was coded by one, but not the other observer. For behaviors measured with interval coding, agreement was scored for each interval that each observer either observed or did not observe a behavior. The percentage of agreement was calculated for each category of behavior using the formula: Number of agreements divided by the number of agreements plus disagreements with the quotient multiplied by 100. The same formula was used for event and interval coding. The percentages of interobserver agreement remained primarily above 80% throughout the study. When percentages were below 80%, consensus coding was done. Results of IOA are presented in Table 6.

Table 6

Mean Interobserver Agreement Across Intervention

Behavior Measured	Dyad 1	Dyad 2	Dyad 3
Mirroring M(SD)	91.0(12.4)	87.1(10.9)	93.9(8.2)
Nonverbal Turn-taking M(SD)	91.0(11.5)	97.1(5.1)	95.8(7.7)
Typical Sibling Commenting M(SD)	89.5(9.1)	89.6(9.3)	88.5(8.9)
Typical Sibling Repeating M(SD)	99.3(3.2)	98.7(3.3)	100(0)
Sibling with a disability verbal commenting M(SD)	92.3(5.9)	91.9(8.9)	89.1(6.2)
Sibling with a disability nonverbal commenting M(SD)	100(0)	100(0)	100(0)
Sibling with a disability verbal requesting M(SD)	100(0)	100(0)	100(0)
Sibling with a disability nonverbal requesting M(SD)	100(0)	100(0)	100(0)
Interventionist prompts M(SD)	100(0)	100(0)	99.4(2.8)
Interventionist praise M(SD)	99.1(3.3)	100(0)	100(0)
All behaviors M(SD)	96.2(7.7)	96.4(7.3)	96.7(6.6)

Procedural Fidelity

Procedural fidelity also was assessed on 25% of each dyad's intervention sessions (See Table 7). To assess procedural fidelity, the primary observer used a 16-item procedural fidelity checklist to score the behaviors of the interventionist (See Appendix C). Percent fidelity was calculated using the formula: Number of items scored as correct divided by the total number of items planned with the quotient multiplied by 100. Procedural fidelity ranged between 88% and 100% for all three dyads across mirroring, nonverbal turn-taking, and responding training sessions.

Table 7

Mean Percent Procedural Fidelity Ratings

Dyad #	M(SD)
Dyad 1	92.2(5.5)
Dyad 2	94.0(6.0)
Dyad 3	94.5(4.7)

Note. Procedural fidelity was assessed on 25% of all intervention sessions for each dyad.

Experimental Procedures

A multiple probe across behaviors design (McReynold & Kearns, 1983) replicated across three sibling dyads was used. The intervention was divided into 5 phases: 1) baseline, 2) mirroring training, 3) nonverbal turn-taking training, 4) verbal responding training, and 5) generalization observations. Generalization training took

place between the verbal responding training phase and the generalization observations phase.

Pre-baseline

Prior to the start of baseline, typical siblings and siblings with disabilities were administered standardized assessments. The siblings with disabilities participated in a 20 min language sample and were given the PPVT so that language abilities could be determined and a language delay could be confirmed. Typical siblings also completed an informal toy preference assessment. In this assessment, siblings were asked to select three activities from each of three lists of play activities, including social toys, independent toys, and shared-product routines they would enjoy participating in with their younger siblings throughout the intervention. A list of possible activities in the RI training phase and in generalization sessions can be found in Table 2. Social toys and independent toys were selected from a list developed by Ivory and McCollum (1999).

The typical siblings also participated in creating a sibling story with the interventionist (Appendix D). This activity consisted of a discussion between the interventionist and the typical sibling. The discussion included questions about the likes, dislikes, strengths, and weaknesses of the typical sibling and the sibling with a disability. Issues regarding the siblings' relationship and what is good and hard about the relationship were also discussed. The sibling story concluded with a discussion about what the typical sibling hoped to learn from the intervention and how it might affect their relationship. This activity served to build rapport between the interventionist and the

typical siblings as well as help the typical sibling understand the purpose of the intervention.

Baseline

Baseline sessions were conducted twice each week at the children's homes. During baseline observations, siblings were asked to play together for 5 to 10 min with the toys provided by the interventionist and to stay within the designated play area. No other directions were given. Each baseline session included one activity from the training context (i.e., social toys) and one activity from each of the two generalization contexts (i.e., independent toys and shared-product routines). The three activities selected by the siblings from each of the three contexts were rotated across sessions. For example, over the period of three sessions, siblings participated in nine different activities from three different contexts.

Baseline sessions were similar to training sessions in that the siblings were asked to stay in one room for the entire 10 min session with the television and radio off and with parents and other siblings outside of the room. Toys and activities were provided by the interventionist at each session. Social toys were selected for the RI training phase of intervention because they are presumably the easiest activities for siblings to learn to use RI strategies.

Intervention

Intervention sessions were conducted twice each week in the home and lasted 30 to 60 min. Intervention sessions were divided into three segments. The first segment

included either the interventionist teaching the typical siblings one of the RI strategies or reviewing the previously taught strategies. The siblings with disabilities were not present during this portion of the intervention sessions. There were four subcomponents to the teaching and reviewing portion of the intervention: (a) presentation of information by the interventionist with the use of a RI Pictorial Manual developed for this project (See Appendix E), (b) opportunity for the typical sibling to discuss the procedures and ask questions, (c) use of modeling and role-play to practice using the strategies, and (d) a second opportunity to discuss and ask questions. Procedural fidelity data were collected on each component during at least 33% of the sessions. Typically, the teaching part of the sessions lasted about 20 min and became briefer during the latter portions of each intervention phase.

The next 10 min involved a play-based interaction between the typical sibling and the sibling with disabilities. This interaction was videotaped. Data were collected from the first full 5 min of the tape; that is, the coder began coding at the beginning of the first full minute of the taped session and continued coding through 5 min of data. After the play interaction, the interventionist provided positive and corrective feedback to the typical sibling while the typical sibling, the sibling with a disability, and the interventionist watched the video of the preceding play interaction. The session concluded with the interventionist and the typical sibling planning activities for the next intervention session.

Training in social toy activities continued until the typical sibling reached criterion level performance in the use of RI strategies for three consecutive sessions in the training context. For mirroring and nonverbal turn-taking, criterion level performance

was set at a total of 50% of the intervals from the 5 min of coded data. For responding, criterion was set at 50% responsiveness. Criterion levels were based on the results of the previous RI studies with siblings. Once criterion-level performance was reached, intervention sessions primarily consisted of a brief reminder by the interventionist to use the strategies with limited coaching and feedback.

Generalization Training and Probes

Generalization probes were conducted throughout baseline and RI training sessions (See Figure 1). During baseline probes, sibling dyads participated in one activity from each generalization context during each baseline session. During RI training probes, siblings participated in one activity from one of the two generalization contexts at each session. For example, if the siblings played with a social toy and an independent toy in session one, then they would play with a social toy and participate in a shared-product routine in the next session. No coaching or feedback was provided during these probes.

Figure 1

Training and Generalization Contexts

Responsive Interaction
Training Phase

Generalization Probes
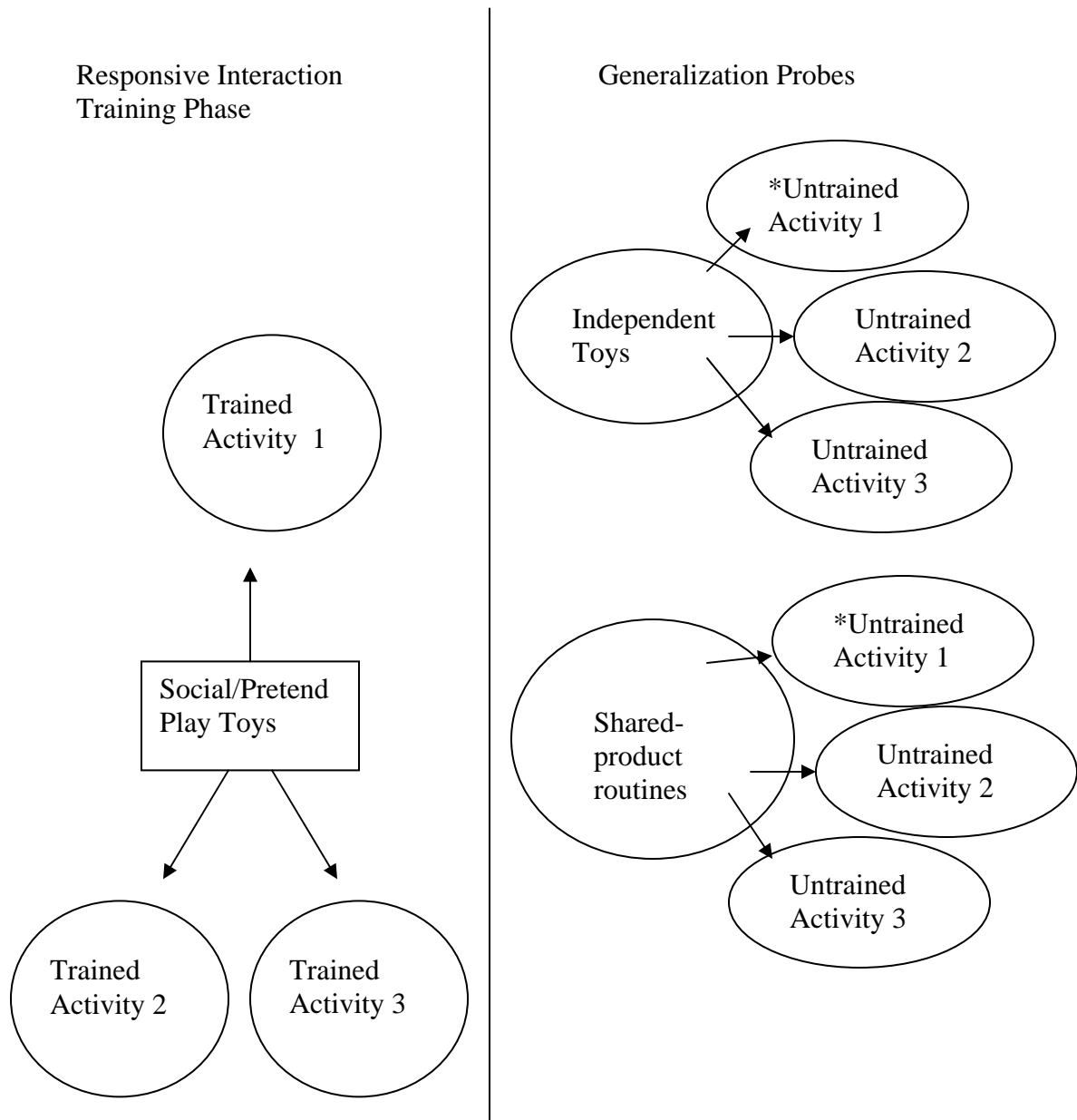
*All independent play activities and shared-product routines were probed during baseline and RI training. Dyad 3 received training in Activity 1 in generalization training

If typical siblings did not generalize to the two generalization contexts by the end of the verbal responding training phase, two intensive generalization training sessions were conducted (See Figure 2). Generalization training was only implemented for TS3. RI strategies were taught across 2 generalization contexts, these categories included independent toys and household routines/shared-product routines. From each of these contexts, one activity was selected and training was conducted in that activity. Training consisted of review of RI strategies, planning for the use of the strategies in activities using worksheets (Appendix G), role-play with the interventionist, and self-evaluation by the typical sibling (Appendix F). The two remaining activities in each generalization session were not explicitly training; siblings completed the worksheets and self-evaluations but no coach or feedback was provided by the instructor.

Baseline	Mirroring Training	Nonverbal Turn-taking Training	Verbal Responding Training		Generalization Observations	Follow-up
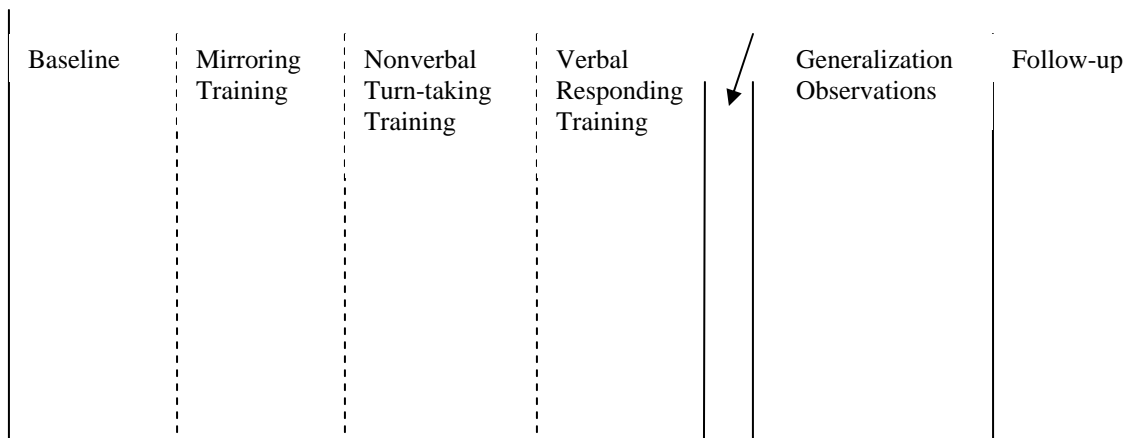
Note: Generalization probes occurred across all phases in two generalization contexts.

Figure 2. Phases of Intervention

During the review, the TS3 reviewed the RI manual and was taught two strategies for arranging the environment for responsive interaction in a variety of activities. These strategies included: 1) sharing materials and taking turns participating in the activity (i.e., putting a dish in the dishwasher) and assigning roles for participating in the activity (i.e., the sibling with a disability is assigned the role of handing spoons of peanut butter to the typical sibling and the typical sibling is assigned the role of spreading the peanut butter on the cracker). During planning, the typical siblings completed two worksheets, one for the independent toy activities and one for the shared-product routines. The worksheets included questions regarding how the typical sibling could use the RI strategies to play with and work with her younger sibling. During role-play, the typical sibling practiced using the RI strategies with the interventionist. Finally, during self-evaluations, the typical sibling completed a worksheet consisting of questions regarding her use of the RI

strategies in the preceding practice session. The typical sibling did not practice with her

sibling with disability during generalization training.

Following generalization training, the TS3's use of RI strategies was observed in

the generalization training activities and two untrained activities from each generalization

context. During observations, the interventionist reminded the TS3 to use the RI

strategies and helped her to select an environmental arrangement strategy to facilitate

responsive interaction. Following each activity, trained and untrained, the typical TS3

was asked to complete the self-evaluation worksheet. Coaching and feedback were not

included during any of the generalization observations.

Each generalization context was observed during each generalization session.

That is, a trained or untrained activity from each of the two generalization contexts was

probed during each generalization session. Probes continued until typical siblings reached

criterion level performance or completed 32 training sessions (i.e., 4 mos).

Data Analysis

Visual Inspection

Visual inspection of typical siblings' graphs of performance was used to

determine whether typical siblings learned to use the responsive interaction strategies in

the training setting and both generalization contexts (Tawney & Gast, 1974). Visual

inspection of data graphs was also used to determine whether changes occurred in the

communicative performance of the siblings with disabilities from baseline to the end of

intervention. Graphs were inspected for changes in levels, trend, and variability within and across conditions.

Sequential Analysis

      Sequential analysis procedures were used to determine if the probability of a turn taken by the sibling with a disability following a turn taken by the typical sibling changed across baseline and each intervention condition. The same procedure was used to determine if the probability of a turn taken by the typical sibling following a turn taken by the sibling with a disability changed across baseline and each intervention condition. This procedure was selected to further investigate the acquisition of responsive interaction skills of the typical sibling (i.e., verbal responsiveness) as well as the effects on the child with a disability. A computer program, Multiple Option Observation System for Experimental Studies (MOOSES; Tapp, 2003), was used to perform the calculations.

      Sequential analysis examines whether one behavior increases or decreases the probability of another behavior occurring within a specified number of coded behaviors or time units (Yoder & Tapp, 2004). In time-window sequential analysis, the focus is on whether the antecedent behavior (i.e., the hypothesized causal behavior) increases or decreases the probability of the target behavior (i.e., the hypothesized affected behavior) occurring within a specified window of time units (i.e., within 6s). In this study, the time window was 6s and included the onset of the antecedent and target behavior, the duration of each was ignored; this is called the onset-onset method of analysis. The time window of 6s was selected because typical siblings were taught to wait 5s after each verbal turn.

Time-window sequential analysis uses a contingency table to summarize the data of interest. The table consists of four cells, each representing a combination of the antecedent and target behaviors either occurring or not occurring. The A cell indicates the number of seconds in which the target behavior occurred within 6s of the antecedent behavior. The B cell indicates all seconds that are within 6 seconds of the antecedent at which the target does not occur. The C cell indicates all seconds at which the target occurs outside of the 6s antecedent time. The D cell indicates all seconds at which neither the 6s antecedent time window or target behavior occurs. (Yoder & Tapp, 2004)

Yule's Q was used as the index of sequential association because it controls for the base rates of the antecedent and target behavior as well as the total number of coded time units in the behavior sample. The possible range for Yule's Q is -1.0 to 1.0. A Yule's Q of 0 represents the null relationship between the antecedent and target behaviors. A negative Yule's Q means that the target occurs within the antecedent time window less than it occurs outside the antecedent time window and a positive Yule's Q means that the target occurs within the antecedent time window more that it occurs outside of the antecedent time window (Yoder & Tapp, 2004). Using cells from the 2x2 contingency table, Yule's Q is calculated as follows:

Yule's Q = ((A x D) – (B x C)) / ((A x D) + (B + C))

The sessions from baseline, mirroring training, and nonverbal turn-taking training in the social toys, independent toys, and shared-product routines contexts were pooled in order for there to be a sufficient amount of data to run the sequential analysis. An expected value of at least 5 occurrences for each antecedent and target behavior is needed

to produce a valid estimate of the sequential association. Still, the expected values of the antecedent and target behaviors were less than 5 occurrences in some of these phases.

In the social toys context, data from the verbal responding phase of intervention were pooled for the first half of the intervention and the second half of the intervention. This was done for the social toy activities only because the verbal responding phase was significantly longer than the other phases and the siblings performances during the 1st half of the phase differed from their performances in the second half of the phases. For the independent toys and shared-product routine contexts, all of the data from the verbal responding phase was pooled.

A data analysis program, Multiple Option Observation System for Experimental Studies (MOOSES; Tapp, 2003) was used to run the sequential analyses. This program will run a sequential analysis on a single data file or a pooled list of data files. To run the analysis, the user identifies the file(s) to be analyzed, selects the antecedent and target behaviors, and selects which type of sequential analysis he/she wants to use (i.e., time-lag, event-lag, time window). Event lag sequential analysis looks at whether the target behavior occurs immediately after a specified number of behaviors/events that follow the antecedent. Time-lag sequential analysis examines whether the target behavior occurs immediately after a specified number of time units that follow the antecedent. Time-window sequential analysis, which was used in this study, examines whether the target behavior occurs within a specified number of time units that follow the antecedent. When time-window sequential analysis is run, the user can select the length of the time window and whether it is to include the onset or offset of the antecedent and target behaviors.

Once this information is entered, MOOSES runs the analysis and converts the data into

an excel spreadsheet.

CHAPTER III

RESULTS

Four questions were addressed in this study, 1) can older siblings of children with disabilities learn to use RI strategies in the primary intervention context; 2) does older siblings' implementation of RI strategies affect the communicative performance of their younger siblings with disabilities; 3) can older siblings learn to generalize use of RI strategies to two generalization contexts, independent toys and shared-product routines; 4) does older siblings' generalized implementation of RI strategies affect the communicative performance of their younger brothers and sisters in generalization contexts? A fifth question addressed following completion of the study was whether a sequential relationship between the behaviors of the typical siblings and the siblings with disabilities developed across the intervention phases. Five indices of typical sibling behavior were calculated to answer these questions: (a) number of intervals during which mirroring occurred, (b) number of intervals during which turn-taking occurred, (c) frequency of repeating, (d) frequency of describing, (e) combined frequency of repeating and describing, and (f) percent of turns taken by the child with a disability that were responded to by the typical sibling (See Figures 3-14). The means and standard deviations of each typical sibling's performance in each phase of the study are shown in Tables 8 thru 16.

Overview of Results

The number of times the typical siblings mirrored the nonverbal behavior or responded to the verbal behavior of the siblings with disabilities was relatively low throughout baseline. When training was initiated, however, all typical siblings learned and applied the mirroring and, then, the responding strategies in the training setting. TS1 and TS2 quickly learned and generalized the RI strategies. The overall pattern for TS3, however, was somewhat different. TS3 learned to implement the RI strategies in the training setting, but did not increase her use of the responsive interaction strategies in the generalization settings until generalization training was conducted. Follow-up data suggest maintenance of performance for TS1 and TS2, but not for TS3.

Children with disabilities increased their number of comments in the training setting. DS1 and DS2 showed a slight increase in their mean levels of commenting from baseline to the end of intervention in the two generalization contexts. DS3 showed a slight increase in his mean level of commenting from baseline to the end of intervention in the primary training context. The increase in commenting following intervention occurred without direct prompting from the older siblings. DS1 and DS3 also demonstrated improvements on PPVT scores, MLU, and diversity from pre- to post-intervention. Rates of commenting at the 1-mo follow-up were comparable to intervention levels for all three siblings with disabilities.

In the following section, results of the RI intervention are detailed for each sibling dyad. First, performance of the Dyad 1 in the primary training context and the two generalization contexts is described. Then, the performance Dyad 2 and Dyad 3 are

presented in the same order. Finally, results of the sequential analyses are described for all three dyads.

Sibling Dyad 1

Social Toy Activities

    Mirroring and nonverbal turn-taking. Prior to intervention, TS1 demonstrated minimal use of the responsive interaction strategies during social toy activities (See Figure 3). Baseline levels of mirroring, nonverbal turn-taking and commenting were low. Following the introduction of training, TS1 demonstrated an immediate increase in the percent of intervals during which he used both mirroring and nonverbal turn-taking during social toy activities. This increase was followed by alternating increases and decreases in mirroring and nonverbal turn-taking. Generally, when mirroring was low, nonverbal turn-taking was high and vice versa. Still, the combined percentage of intervals during which either mirroring or nonverbal turn-taking was used remained above the 50% criterion level throughout most of each phase. Following the introduction of responding training, the percentage of intervals during which TS1 used mirroring and nonverbal turn-taking was variable but remained above the criterion level of 50% of intervals with the exception of the first data point in this phase. Nonverbal turn-taking was consistently used more often than mirroring throughout the verbal responding training phase. After 3 sessions in the verbal responding training phase, TS1's combined use of mirroring and nonverbal turn-taking was stable and averaged about 70% of intervals.

Verbal responding. TS1 verbally responded about 2.75 times per minute during baseline. TS1's rates of verbal responding increased slightly in the mirroring training and again increased slightly in nonverbal turn-taking training phase after an initial decrease. Following the introduction of verbal responding training, TS1's verbal responding was variable with a slight accelerating trend. By the end of the responding phase, rates of verbal responding were well above baseline levels, averaging about 5 verbal responses per minute, with minimal overlapping data. TS1's verbal responding consisted primarily of describing; levels of repeating were low across baseline, mirroring training, and nonverbal turn-taking training phases. TS1's use of mirroring and verbal responding remained above baseline levels in the social toys activity at the 1-mo follow-up. (See Table 8)

Percentage of responsiveness. Throughout baseline, mirroring training, and nonverbal turn-taking training, TS1's percentage of responsiveness to verbal and nonverbal turns taken by his sibling with Down syndrome remained below the criterion level of 50% responsiveness (See Figure 3). Following the introduction of responding training, TS1 demonstrated a gradual increase to criterion level performance. TS1's percentage of responsiveness increased across the responding training phases with 10 of 13 data points above the criterion level. At the 1-mo follow-up assessment, TS1's percentage responsive was near levels observed during the verbal responding training phase. (See Table 8).

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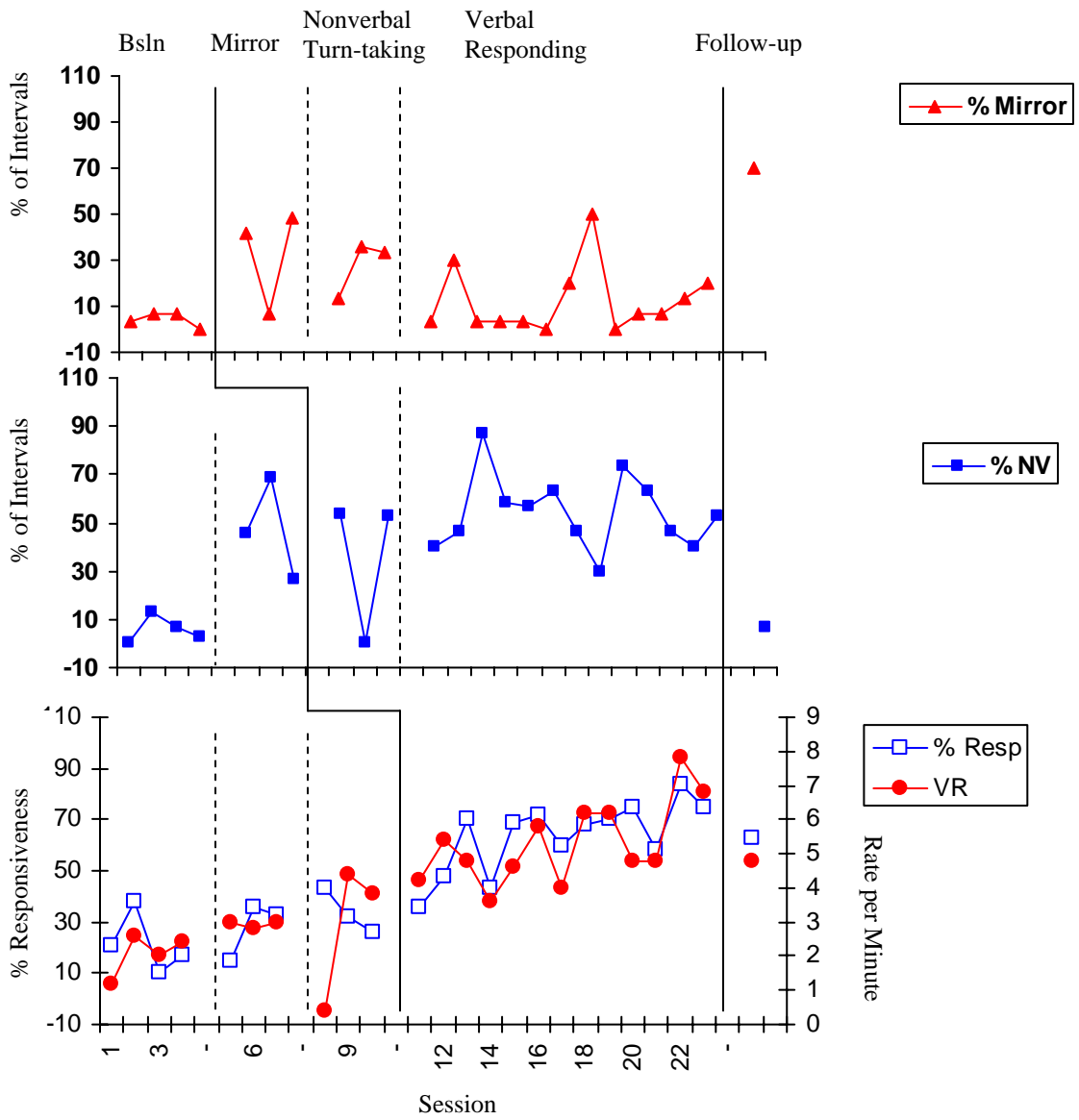
Figure 3. TS1's Use of Mirroring (Mirror), Nonverbal Turn-taking (NV), Verbal Responding (VR) and Percentage of responsiveness (% R) in Social toy activities

Sibling with a disability. Verbal commenting by DS1 was relatively high and consistent throughout the baseline, mirroring, nonverbal turn-taking, and responding training phases averaging about 5 comments per minute (See Figure 4). DS1's rate of verbal commenting was somewhat variable within each condition, but there was no change in level across conditions. DS1's rate of commenting in the social toys activity was comparable to baseline and intervention levels at the 1-mo follow-up assessment. (See Table 8)
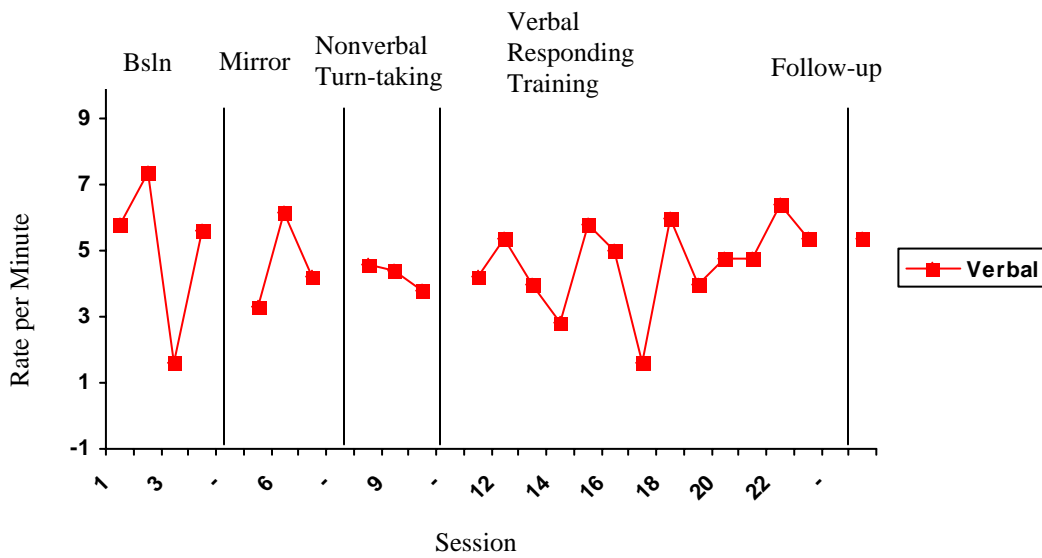
Figure 4 – DS1's Rate of Commenting in Social Toy Activities

Prompts and praise. For TS1, the interventionist's rates of praise and training increased slightly at the beginning of each phase. Rates of praise remained relatively variable but low across the mirroring training, nonverbal turn-taking training and responding training phases. Praise levels increased slightly across each phase with the responding training phase having the highest level of training and praise. (See Table 8)

Table 8

Intervention Effect for Dyad 1 in Social Toy Activities

Sibling Dyad 1	Baseline M(SD)	Mirroring Training M(SD)	Nonverbal Turn-taking M(SD)	Responding Training M(SD)	Follow-up
Mirroring*	4.3(3.4)	32.2(22.5)	27.3(12.2)	12.3 (14.6)	70
Nonverbal Turn-taking*	5.8(5.6)	45.8(23.2)	35.4(30.7)	54.2 (15.2)	6.7
Mirroring + Nonverbal Turn-taking*	10.0(8.4)	78.0(8.5)	62.7(42.9)	66.5 (29.8)	76.7
Responding	2.1(0.6)	3.3(0.8)	3.3(0.8)	5.4 (1.4)	4.8
% Responsiveness	21.5(11.9)	28.0(11.4)	33.7(8.6)	63.7 (14.0)	63
Commenting	5.1(2.5)	4.5(1.5)	4.3(0.4)	4.2 (1.7)	5.4
Nonverbal Commenting	0(0)	0(0)	0(0)	0.02 (0.06)	0
Requesting	0(0)	0(0)	0(0)	0.03 (0.08)	0.2
Nonverbal Requesting	0(0)	0(0)	0(0)	0.02 (0.06)	0
Prompts	0(0)	0.1(0.1)	0.3(0.3)	0.3(0.2)	0
Praise	0(0)	0.6(0.4)	0.5(0.2)	0.4(0.1)	0

*Mirroring and nonverbal turn-taking are total percent of intervals. All other behaviors are rate per minute.

Independent Toys and Shared-Product Routines

Mirroring and nonverbal turn-taking. TS1's use of mirroring and nonverbal turn-taking was variable during independent toy activities prior to the introduction of mirroring training with one data point above the criterion level (See Figure 5). Only one probe was conducted in both the mirroring and nonverbal turn-taking training phases. In

the mirroring training phase, mirroring was high; in the nonverbal turn-taking training phase, nonverbal turn-taking was high. Overall, the percent of intervals during which TS1 used mirroring and/or nonverbal turn-taking during the mirroring and nonverbal turn-taking training phases was above the criterion level. Following the introduction of the responding training phase, the combined percentage of intervals during which TS1 used mirroring and/or nonverbal turn-taking in independent toy activities remained above the criterion level with some variability. Only one data point overlapped with baseline data. Again, nonverbal turn-taking was consistently used more often than mirroring. At the 1-mo follow-up, TS1's use of mirroring was at a level comparable to that observed at the end of the verbal responding training phase.

TS1's combined use of mirroring and nonverbal turn-taking in shared-product routines were above the criterion level prior to implementation of intervention (See Figure 5). Following the introduction of mirroring training and nonverbal turn-taking training, the combined percent of intervals during which TS1 used mirroring and/or nonverbal turn-taking remained above the criterion level with the exception of one data point in the nonverbal turn-taking training phase. TS1's use of mirroring and nonverbal turn-taking continued to remain above the criterion level throughout the responding training phase with the exception of one data point. The percentage of intervals during which TS1 used mirroring and/or nonverbal turn-taking was relatively variable until the last half of the responding training phase. TS1's combined use of mirroring and nonverbal turn-taking remained above the criterion level at the 1-mo follow-up.

Verbal responding. During independent toy activities, TS1's verbal responding was comparable across baseline, mirroring, and nonverbal turn-taking training. Following

the introduction of responding training, visual analysis of TS1's rates of verbal

responding showed a variable, but accelerating trend. By the end of the responding phase,

rates of verbal responding in independent toy activities were above baseline levels with 3

of 7 points overlapping with the baseline data. Again, TS1's verbal responses consisted

primarily of describing in independent toy activities; TS1's use of repeating remained

low throughout the intervention. At the 1-mo follow-up assessment, verbal responding

was above the levels observed at the end of verbal responding training phase.

During shared-product routines, TS1's rates of verbal responding averaged

approximately 2 verbal responses per minute prior to training. An immediate increase in

his rate of verbal responding was evident following the introduction of nonverbal turn-

taking training phase. Following the introduction of the responding training phase, verbal

responding decreased initially but this decrease was following by an accelerating trend in

verbal responding with 2 of 6 points overlapping with baseline level data. At the 1-mo

follow-up, TS1's use of nonverbal turn-taking and verbal responding in the shared-

product routine remained at a level comparable to that observed in the responding

training phase.

Percentage of responsiveness. TS1's percentage of responsiveness during

independent toy activities reached the criterion level of performance during two baseline

sessions (See Figure 5). Percentage of responsiveness during the mirroring and nonverbal

turn-taking training phases, however, were below the criterion level. TS1's percentage of

responsiveness reached the criterion level during the third responding training session

with independent toy activities. TS1's percentage of responsiveness remained above the

criterion level throughout the rest of the responding training phase with limited

variability. TS1's percentage of responsiveness in the independent toys activity was comparable to his performance in the verbal responding training phases at the 1-mo follow-up assessment (See Table 9).

Throughout baseline, mirroring training, and nonverbal turn-taking training, TS1's percentage of responsiveness to verbal and nonverbal turns taken by his sibling during shared-product routines remained below the criterion level of 50% responsiveness (See Figure 19). Following the introduction of verbal responding training, TS1 demonstrated a gradual increase to criterion level performance in the third verbal responding training session. TS1's percentage of responsiveness continued to increase throughout the responding training phase with limited variability. At the 1-mo follow-up assessment, TS1's percentage of responsiveness maintained at the intervention level in the shared-product routine activity (See Table 10).
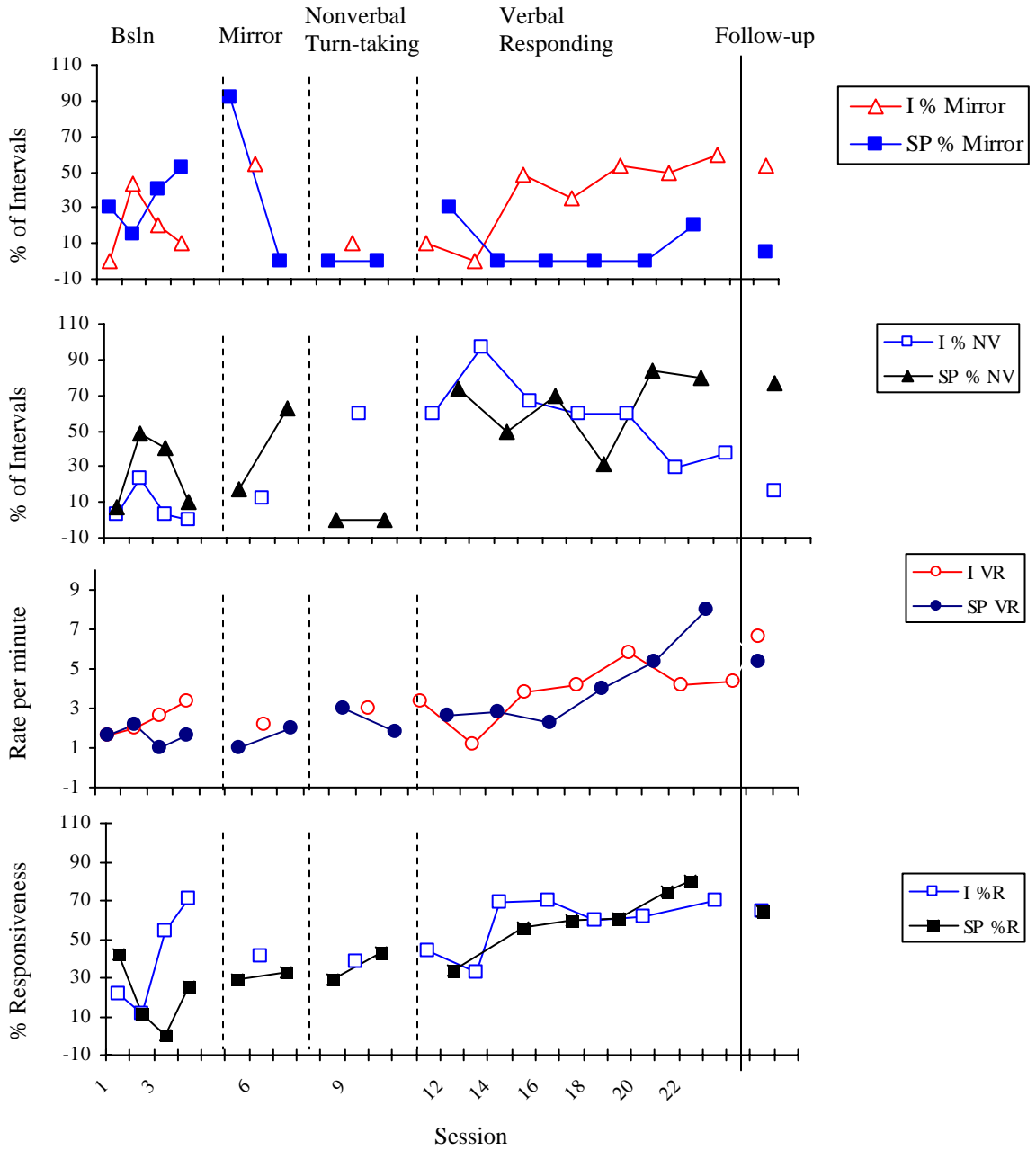
Figure 5 – TS1's Use of Mirroring, Nonverbal Turn-taking (NV), Verbal Responding (VR) and Percentage of Responsiveness (%R) during Generalization Probes, Independent Toy Play (I) and Shared-Product Routines (SP)

Sibling with a disability. DS1's rates of verbal commenting were comparable throughout baseline and the mirroring training phase averaging about 5 comments per minute (See Figure 6). In the nonverbal turn-taking training phase, DS1's rate of commenting decreased well below the baseline level. Following the introduction of the responding training phase, DS1's rate of commenting showed an immediate increase back to the baseline level. This increase was followed by variable levels of commenting with 5 of 7 data points falling below the baseline. At the 1-mo follow-up assessment, DS1's rate of commenting increased slightly above the level observed at the end of the verbal responding training phase in the independent toy activity. (See Table 9)

DS1's rate of commenting in shared-product routines was high in baseline averaging about 5 comments per minute. This rate decreased in the mirroring training phase but returned to baseline levels in the nonverbal turn-taking training phase (See Figure 6). DS1's rate of commenting decreased to below baseline levels following the introduction of the verbal responding training phase but was followed by an accelerating trend. The last two data points of the verbal responding training phase were above the baseline level averaging about 7 comments per minute. At the 1-mo follow-up, DS1's rate of commenting decreased to a level comparable to baseline in the shared-product routines. (See Table 10)
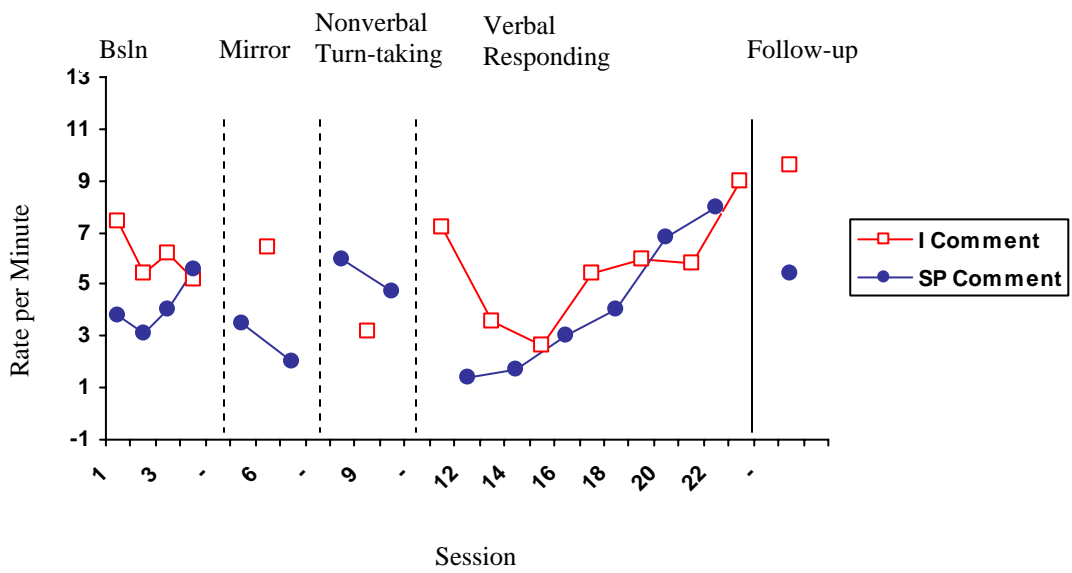
Figure 6 – DS1's Rate of Commenting in Independent Toys and Shared-Product Routines

Table 8

Intervention Effects for Dyad 1 in Independent Toy Activities

	Baseline M(SD)	Mirroring Training M(SD)	Nonverbal Turn-taking Training M(SD)	Responding Training M(SD)	Generalization Training M (SD)	Follow-up
Sibling Dyad 1						
Mirroring*	24.5(18.9)	54.6(0)	10.0(0)	8.3 (18.1)	N/A	53.3
Nonverbal Turn-taking*	7.2(10.6)	12.9(0)	60.0(0)	58.6 (21.8)	N/A	16.7
Mirroring + Nonverbal Turn-taking*	31.8(26.4)	67.5(21.0)	70.0(0)	66.9 (39.9)	N/A	70
Responding	2.5(0.8)	3.0(0)	3.0(0)	4.3 (1.4)	N/A	6.6
% Responsiveness	39.0(28.5)	41.0(0)	38(0)	57.1 (13.6)	N/A	64.6
Commenting	6.1(0.9)	6.4(0)	3.2(0)	5.7 (2.1)	N/A	9.6
Nonverbal Commenting	0.1(0.2)	0(0)	0(0)	0 (0)	N/A	0
Requesting	0.1(0.2)	0(0)	0(0)	0 (0)	N/A	0
Nonverbal Requesting	0.2(0.3)	0(0)	0(0)	0 (0)	N/A	0
Prompts	0(0)	0(0)	0(0)	0 (0)	N/A	0
Praise	0(0)	0(0)	0.2(0)	0 (0)	N/A	0

*Mirroring and nonverbal turn-taking are total percent of intervals. All other behaviors are rate per minute.

Table 10

Intervention Effects for Dyad 1 in Shared-Product Routines

	Baseline M(SD)	Mirroring Training M(SD)	Nonverbal Turn-taking Training M(SD)	Responding Training M(SD)	Generalization M(SD)	Follow-up
Sibling Dyad 1						
Mirroring*	34.5(16.1)	45.9(44.8)	0(0)	6.7 (12.1)	N/A	4.8
Nonverbal Turn-taking*	23.8(23.8)	39.8(32.2)	36.9(52.1)	65.3 (20.3)	N/A	81
Mirroring + Nonverbal Turn-taking*	58.3(18.0)	90.6(39.7)	36.9(52.1)	72 (32.4)	N/A	85.8
Responding	1.6(0.4)	1.5(0.7)	3.9(1.2)	4.7 (2.1)	N/A	5.4
% Responsiveness	19.5(18.2)	31.0(2.8)	31(2.8)	54.7 (14.7)	N/A	84.2
Commenting	3.4(1.9)	2.5(0.7)	5.4(0.9)	4.7 (2.4)	N/A	5.4
Nonverbal Commenting	0.1(0.1)	0(0)	0(0)	0 (0)	N/A	0
Requesting	0(0)	0(0)	0(0)	0 (0)	N/A	0.6
Nonverbal Requesting	0(0)	0(0)	0(0)	0 (0)	N/A	0
Prompts	0(0)	0(0)	0.5(0.7)	0 (0)	N/A	0
Praise	0(0)	0(0)	0(0)	0 (0)	N/A	0

*Mirroring and nonverbal turn-taking are total percent of intervals. All other behaviors are rate per minute.

Social toy activities

Mirroring and nonverbal turn-taking. Prior to intervention, TS2 demonstrated minimal use of the responsive interaction strategies in the social toy activities (See Figure 7). Baseline levels of mirroring, nonverbal turn-taking and commenting were all low. Following the introduction of mirroring training, TS2 demonstrated an immediate increase in the percent of intervals during which she used mirroring during social toy activities. Similarly, following the introduction of nonverbal turn-taking, TS2 showed an immediate increase in the percent of intervals during which she used nonverbal turn-taking. The increase in nonverbal turn-taking coincided with a decrease in percentage of intervals during which mirroring was used. Although TS2 decreased her use of mirroring, the combined percentages of intervals during which either mirroring or nonverbal turn-taking was used stayed above the 50% criterion level throughout most of each phase. Following the introduction of verbal responding training, the percent of intervals during which TS2 used mirroring and nonverbal turn-taking were variable but above the criterion level of 50% of intervals during 6 of 8 sessions. Toward the end of the responding phase, TS2's use of mirroring and nonverbal turn-taking stabilized.

Verbal responding. TS2 verbally responded about 2.5 times per minute during baseline. Verbal responding during the mirroring training and nonverbal turn-taking training phases, however, decreased to below baseline levels. After the introduction of verbal responding training, her verbal responding increased immediately and showed an accelerating trend over time. By the end of the responding phase, rates of verbal

responding were well above baseline levels. Like TS1, TS2's verbal responses consisted primarily of describing in each context, social toys, independent toys, and shared-product routines; levels of repeating were low and comparable across baseline, mirroring training, and nonverbal turn-taking training phases. TS2's use of mirroring, nonverbal turn-taking, and verbal responding at the 1-mo follow-up were comparable to TS2's performance at the end of intervention (See Table 11)

 Percentage of responsiveness. Throughout baseline, mirroring training, and nonverbal turn-taking training, TS2's percentage of responsiveness to verbal and nonverbal turns taken by her sibling with Down syndrome remained below the criterion level of 50% responsiveness (See Figure 7). Following the introduction of verbal responding training, TS2 increased her levels to criterion. TS2's percentage of responsiveness remained high throughout the responding training phase. TS2's percentage of responsiveness remained above criterion level at the 1-mo follow-up in the social toys activity. (See Table 11)
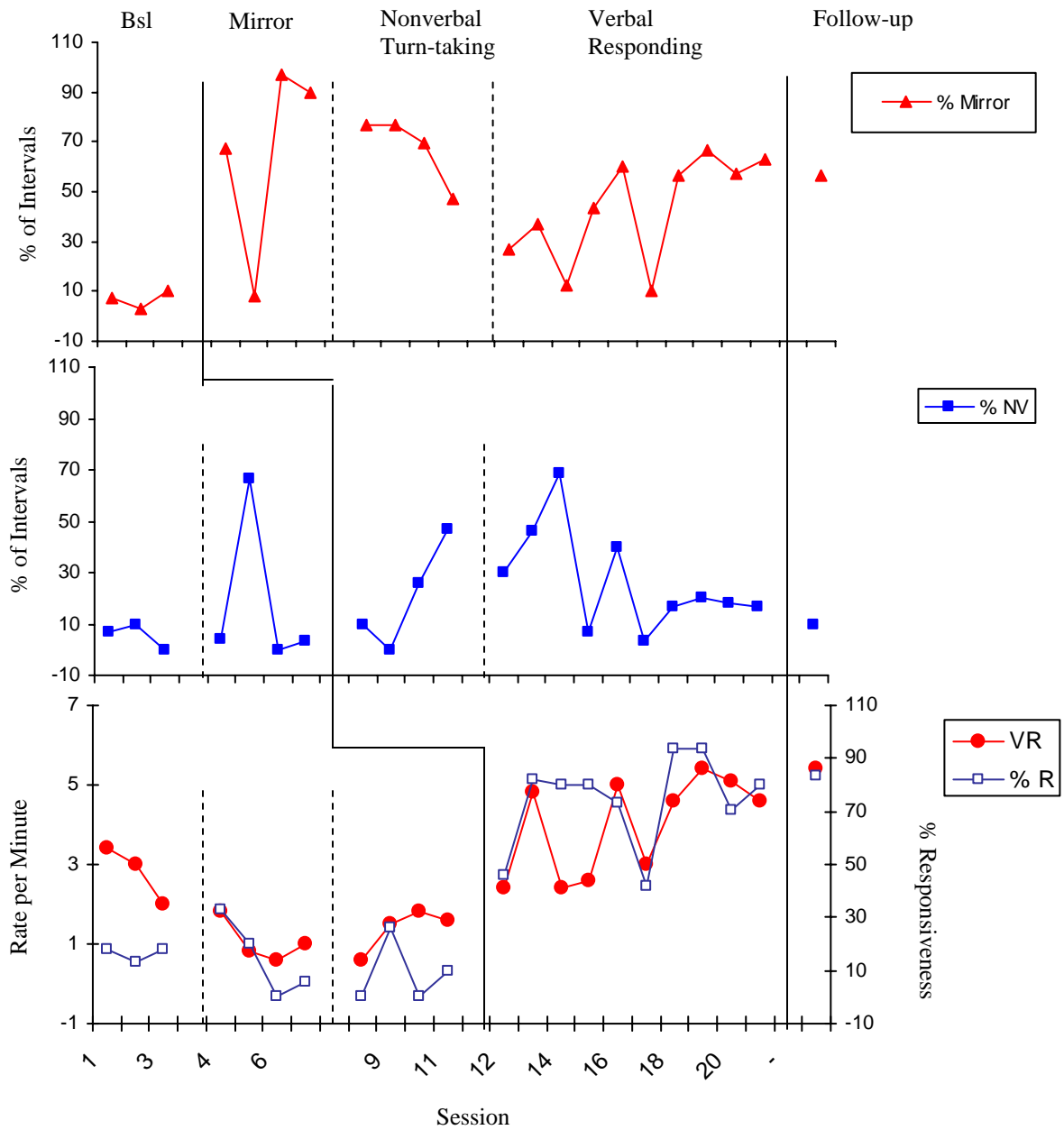
Figure 7 - TS2's Use of Mirroring (Mirror), Nonverbal Turn-taking (NV), Verbal
Responding (VR), and Percentage of Responsiveness (%R) in Social Toy Activities

Sibling with a disability. Rates of verbal commenting by DS2 were variable throughout the baseline, mirroring, nonverbal turn-taking, and responding training phases averaging about 2.5 comments per minute (See Figure 8). There was no change in the level of his verbal commenting across phases. TS2's rate of commenting was comparable to baseline and intervention levels at the 1-mo follow-up. (See Table 11)
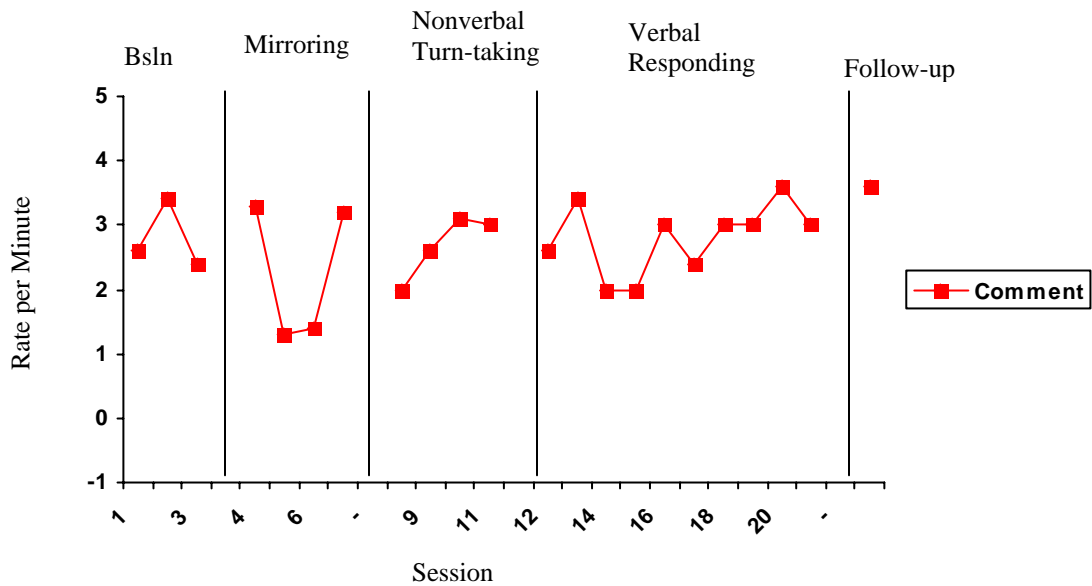
Figure 8 – DS2's Rate of Commenting in Social Toy Activities

Prompts and praise. For TS2, the interventionist's rates of praise and training increased slightly at the beginning of each phase. Rates of praise were relatively variable but low across the mirroring training, nonverbal turn-taking training and responding training phases. Praise levels increased slightly across each phase; the responding training phase had the highest level of praise. (See Table 11)

Table 11

Intervention Effects for Dyad 2 in Social Toy Activities

	Baseline *M(SD)*	Mirroring Training *M(SD)*	Nonverbal Turn-taking *M(SD)*	Responding Training *M(SD)*	Follow-up
Sibling Dyad 2					
Mirroring*	4.3(2.3)	65.5(40.2)	61.65(13.8)	43.3 (21.0)	56.7
Nonverbal Turn-taking*	18.5(32.2)	18.5(32.2)	20.8(20.5)	26.6 (20.0)	10
Mirroring + Nonverbal Turn-taking*	10.0(6.0)	84.0(12.9)	82.45(34.3)	69.9 (41.0)	66.7
Responding	2.9(0.8)	1.4(0.9)	1.4(0.5)	4.0 (1.2)	5.4
% Responsiveness	16.3(2.9)	14.8(14.8)	9.0(12.3)	74.0 (17.5)	83.3
Commenting	2.8(0.5)	2.3(1.1)	2.7(0.5)	2.8 (0.5)	3.6
Nonverbal Commenting	0(0)	0(0)	0(0)	0 (0)	0
Requesting	0(0)	0(0)	0(0)	0 (0)	0
Nonverbal Requesting	0(0)	0(0)	0(0)	0 (0)	0
Prompts	0(0)	1.1(0.5)	1.4(0.4)	2.0 (0.5)	0
Praise	0(0)	1.9(0.3)	1.6(0.5)	1.2 (0.9)	0

*Mirroring and nonverbal turn-taking are total percent of intervals. All other behaviors are rate per minute.

Independent Toys and Shared-Product Routines

     Mirroring and nonverbal turn-taking. TS2's use of mirroring and nonverbal turn-taking was somewhat variable during the independent toy activities prior to the introduction of mirroring training (See Figure 9). The percent of intervals during which TS2 used mirroring increased to above the criterion level immediately following the

introduction of mirroring training. Similarly, following the introduction of nonverbal

turn-taking training, TS2 showed an immediate increase in her use of nonverbal turn-

taking. Mirroring and nonverbal turn-taking was alternatively high and low throughout

the nonverbal turn-taking and verbal responding training phases; when nonverbal turn-

taking was high, mirroring was low and vice versa. Combined percentages of mirroring

and nonverbal turn-taking remained well above the criterion level throughout the

mirroring training, nonverbal turn-taking training, and responding training phase in the

independent toy activities.

During baseline, TS2's use of mirroring and nonverbal turn-taking was variable in

the shared-product routines (See Figure 9). Use of mirroring and nonverbal turn-taking

remained near baseline levels throughout the nonverbal turn-taking training phase with

only one data point above the criterion level of 50%. During the verbal responding

training, TS2's use of mirroring and nonverbal turn-taking was variable. The total

percentage of intervals during which either mirroring or nonverbal turn-taking was used

was above the criterion level and were relatively stable in the shared-product routines.

Verbal responding. During independent toy activities, TS2's use of verbal

responding was somewhat variable across baseline, mirroring, and nonverbal turn-taking

training with an average of approximately 2 to 2.5 verbal responses per minute. Verbal

responding increased in the first session of the nonverbal turn-taking training phase but

returned to baseline levels in the second session. Following the introduction of verbal

responding training, TS2's verbal responding increased and showed an accelerating trend

across the 5 sessions to a high of 6 verbal responses per minute. TS2's use of mirroring

and verbal responding remained above baseline levels at the 1-mo follow-up (See Table 12).

During shared-product routines, TS2's use of verbal responding averaged about 2 verbal responses per minute across baseline, mirroring, and nonverbal turn-taking training. Verbal responding increased briefly during the mirroring training phase but quickly returned to baseline levels during the nonverbal turn-taking training phase. Following the introduction of verbal responding training, TS2's verbal responding immediately increased well above the baseline level, averaging about 4 verbal responses per minute. The remaining data from the responding training phase were variable but suggest an accelerating trend. At the 1-mo follow-up, TS2's use of mirroring and verbal responding decreased slightly but remained above baseline levels. (See Table 13)

Percentage of responsiveness. TS2's percentage of responsiveness during independent toy activities remained below the criterion level throughout the baseline, mirroring training, and nonverbal turn-taking training phases (See Figure 9). Following the introduction of verbal responding training, TS2 showed an immediate increase in her percentage of responsiveness. TS2's percentage of responsiveness remained above the criterion level throughout the responding training phase with limited variability. TS2's percentage of responsiveness was above intervention levels at the 1-mo follow-up in the independent toys activity. (See Table 12)

TS2's percentage of responsiveness during shared-product routines remained below the criterion level throughout the baseline, mirroring training, and nonverbal turn-taking training phases (See Figure 9). Following the introduction of verbal responding training, TS2 showed an immediate increase in her percentage of responsiveness.

Responsiveness remained above the criterion level throughout the responding training phase with some variability. TS2's percentage of responsiveness decreased below the level observed in the verbal responding training phase, but remained above the baseline level at the 1-mo follow-up. (See Table 13).
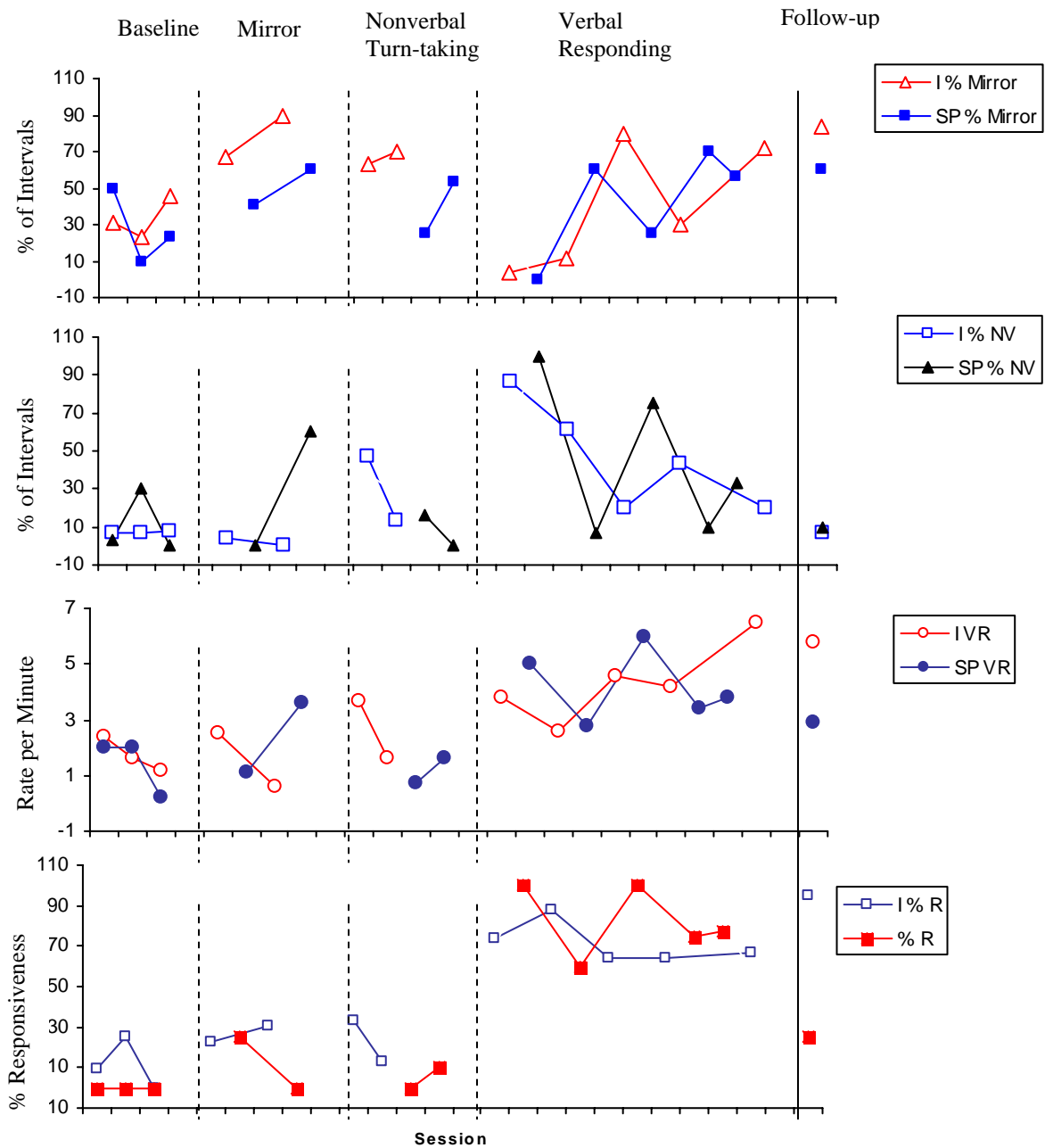
Figure 9 - TS2's Use of Mirroring (Mirror), Nonverbal Turn-taking (NV), Verbal Responding, and Percentage of Responsiveness (%R) during Generalization Probes, Independent Toy Play (I) and Shared-Product Routines (SP)

Sibling with a disability. Levels of verbal commenting by DS2 increased slightly above baseline levels during the mirroring training and nonverbal turn-taking training phases averaging about 2.5 comments per minute. DS2's rates of commenting during the responding training phase, however, were quite variable with one data point overlapping with the baseline levels (See Figure 10). Only 2 data points in the responding training phase were above the level from the previous phases, at about 4 comments per minute. At the 1-mo follow-up, TS2's rate of commenting in the independent toys activity was comparable to the level observed at the end of intervention. (See Table 12)

In shared-product routines, DS2's rate of commenting increased to above the baseline level during the second probe of the mirroring training phase (See Figure 10). This increase was followed by an immediate decrease at the start of the nonverbal turn-taking training phase. DS2's rate of commenting returned to above the baseline level during the second probe of the nonverbal turn-taking training phase. Following the introduction of the responding training phase, DS2's rate of commenting decreased to the baseline level again. The remaining probes in the responding training phase were variable but above the baseline level. In the shared-product routine, DS2's rate of commenting was comparable to the baseline level at the 1-mo follow-up assessment (See Table 13).
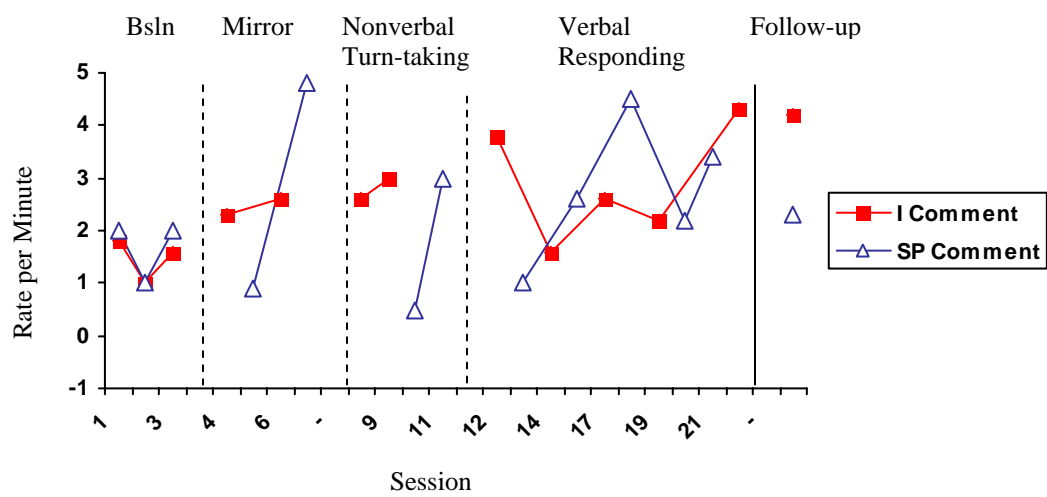
Figure 10 – DS2's Rate of Commenting in Independent Toy Activities and Shared-Product Routines

Table 12

Intervention Effects of Dyad 2 in Independent Toy Activities

	Baseline *M(SD)*	Mirroring Training *M(SD)*	Nonverbal Turn-taking Training *M(SD)*	Responding Training *M(SD)*	Generalization Training *M (SD)*	Follow-up
Sibling Dyad 2						
Mirroring*	33.3(11.7)	78.5(16.3)	66.5(4.9)	39.3 (35.0)	N/A	83.3
Nonverbal Turn-taking*	7.3(0.6)	2.0(2.8)	96.7(18.9)	46.1 (28.3)	N/A	6.7
Mirroring + Nonverbal Turn-taking*	40.7(12.2)	80.5(13.4)	163.2(23.8)	85.4 (63.3)	N/A	90
Responding	1.8(0.7)	2.2(1.6)	2.7(1.5)	4.4 (1.4)	N/A	5.8
% Responsiveness	3(5.2)	27(5.7)	23.3(14.1)	71.2 (10.3)	N/A	95.2
Commenting	1.1(1.0)	2.5(0.2)	2.8(0.3)	2.9 (1.1)	N/A	4.2
Nonverbal Commenting	0(0)	0(0)	0(0)	0 (0)	N/A	0
Requesting	0(0)	0(0)	0(0)	0 (0)	N/A	0
Nonverbal Request	0(0)	0(0)	0(0)	0 (0)	N/A	0
Prompts	0(0)	0(0)	0(0)	0 (0)	N/A	0
Praise	0(0)	0(0)	0(0)	0 (0)	N/A	0

*Mirroring and nonverbal turn-taking are total percent of intervals. All other behaviors are rate per minute.

Table 13

Intervention Effects for Dyad 2 in Shared-Product Routines

Sibling Dyad 2	Baseline M(SD)	Mirroring Training M(SD)	Nonverbal Turn-taking Training M(SD)	Responding Training M(SD)	Generalization M(SD)	Follow-up
Mirroring*	27.7(20.4)	50.4(13.6)	39.2(20.0)	62.3 (27.0)	N/A	60
Nonverbal Turn-taking*	11.0(16.5)	30.0(42.4)	8.4(11.8)	25 (30.6)	N/A	10
Mirroring + Nonverbal Turn-taking*	38.7(15.0)	80.4(56.1)	47.6(31.8)	87.3 (57.6)	N/A	70
Responding	1.4(1.0)	2.4(1.8)	1.2(0.6)	4.0 (1.4)	N/A	2.9
% Responsiveness	0(0)	12.5(17.7)	5(7.1)	82.4 (17.4)	N/A	25
Commenting	1.7(0.6)	2.9(2.8)	1.8(9.2)	2.5 (1.7)	N/A	2.3
Nonverbal Commenting	0(0)	0(0)	0(0)	0 (0)	N/A	0
Requesting	0(0)	0(0)	0(0)	0 (0)	N/A	0
Nonverbal Requesting	0(0)	0(0)	0(0)	0 (0)	N/A	0
Prompts	0(0)	0(0)	0(0)	0 (0)	N/A	0
Praise	0(0)	0(0)	0(0)	0 (0)	N/A	0

*Mirroring and nonverbal turn-taking are total percent of intervals. All other behaviors are rate per minute.

Social Toy Activities

  Mirroring and nonverbal turn-taking. Prior to intervention, TS3 demonstrated minimal use of the responsive interaction strategies (See Figure11). Baseline levels of mirroring, nonverbal turn-taking and verbal responding were low. Following the introduction of mirroring training, TS3 demonstrated an immediate increase in the percent of intervals during which she used mirroring during social toy activities. Similarly, following the introduction of nonverbal turn-taking, TS3 showed an immediate increase in the percent of intervals during which she used nonverbal turn-taking. Following the introduction of nonverbal turn-taking, TS3's use of mirroring and nonverbal turn-taking was variable. While the use of mirroring and use of nonverbal turn-taking were variable, combined use of the two strategies stayed above the 50% criterion level throughout most of each phase. Following the introduction of verbal responding training, the percent of intervals during which TS3 used mirroring and nonverbal turn-taking decreased to below the criterion level, but returned to above the criterion level during the second half of the responding training phase.

  Verbal responding. TS3 showed limited verbal responding prior to the introduction of the verbal responding training phase. Levels of verbal responding were low and comparable across baseline, mirroring training, and nonverbal turn-taking training phases. Following the introduction of responding training, however, TS3's use of verbal responding showed an immediate increase and a steady accelerating trend throughout the responding training phase. In the social toys context and both

66

generalization contexts, TS3's verbal responding consisted primarily of describing. TS3's use of repeating remained low throughout the entire intervention. During follow-up, TS3's use of mirroring, nonverbal turn-taking, and verbal responding remained above baseline levels, but decreased from levels observed at the end of intervention (See Table 14).

Percentage of responsiveness. Throughout baseline, mirroring training, and nonverbal turn-taking training, TS3's percentage of responsiveness to the verbal and nonverbal turns taken by her sibling with autism remained below the criterion level of 50% responsiveness (See Figure 11) in social toy activities. Following the introduction of verbal responding training, TS3 demonstrated an immediate increase to criterion level performance. Her performance throughout the first half of the verbal responding training phase was variable with 4 out of 6 data points below 50% criterion level. During the second half of the phase, however, TS3's percentage of responsiveness stabilized at criterion level during the last three sessions. At the 1-mo follow-up, TS3's percentage of responsiveness decreased to near baseline levels in the social toys activity. (See Table 14)
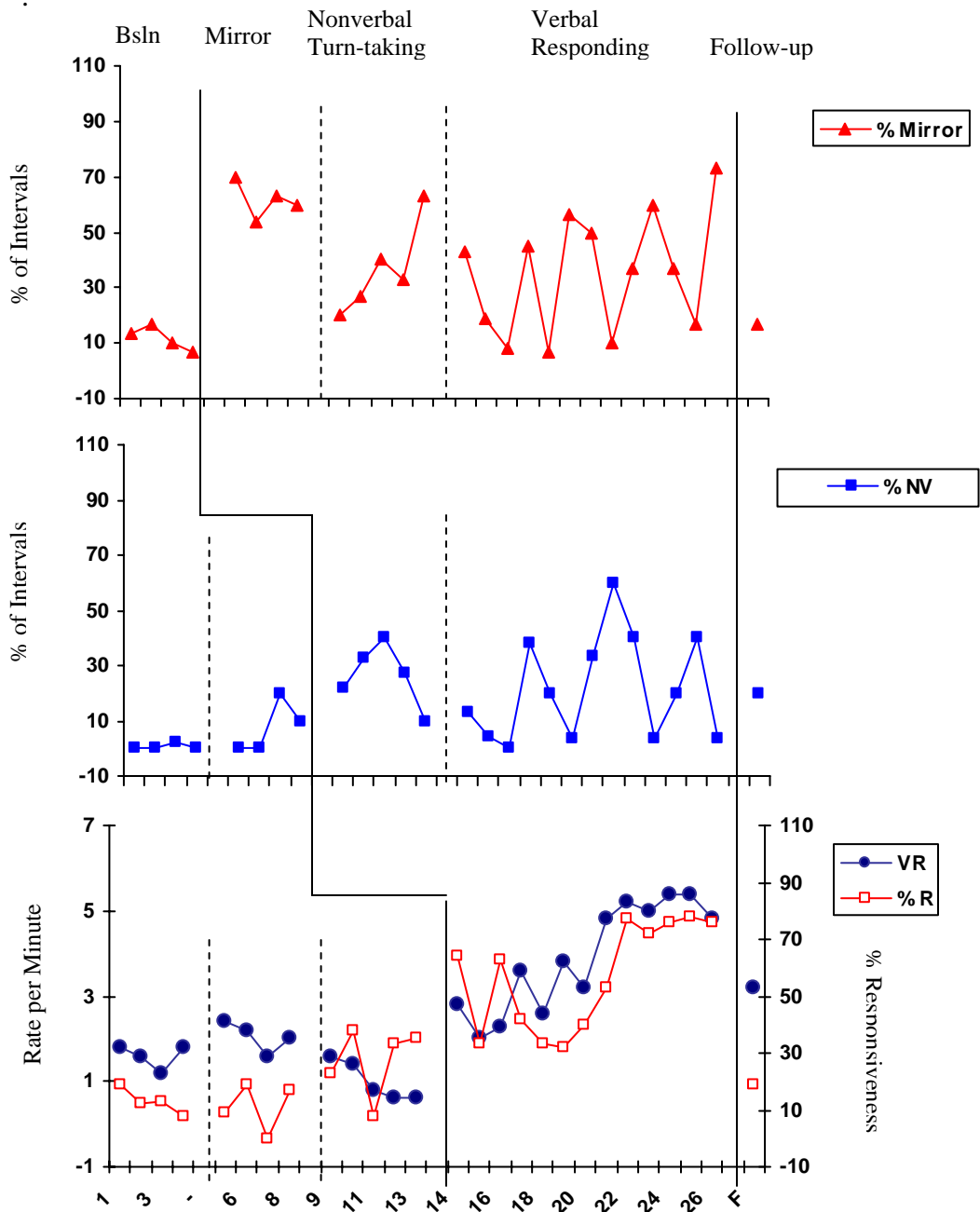
Figure 11 – TS3 Use of Mirroring (Mirror), Nonverbal Turn-taking (NV), Verbal Responding (VR), and Percentage of Responsiveness (%R) in Social Toy Activities

68

Sibling with a disability. Verbal commenting by DS3 in social toy activities was relatively consistent throughout the baseline and mirroring training phases (See Figure 12). DS3's rate of verbal commenting showed a slight increase during the nonverbal turn-taking training phase. This change in level maintained, with some variability throughout the responding training phase. Only 2 of 13 data points in the verbal responding phase overlapped with baseline data. DS3's rate of commenting returned to near baseline level at the 1-mo follow-up (See Table 14).
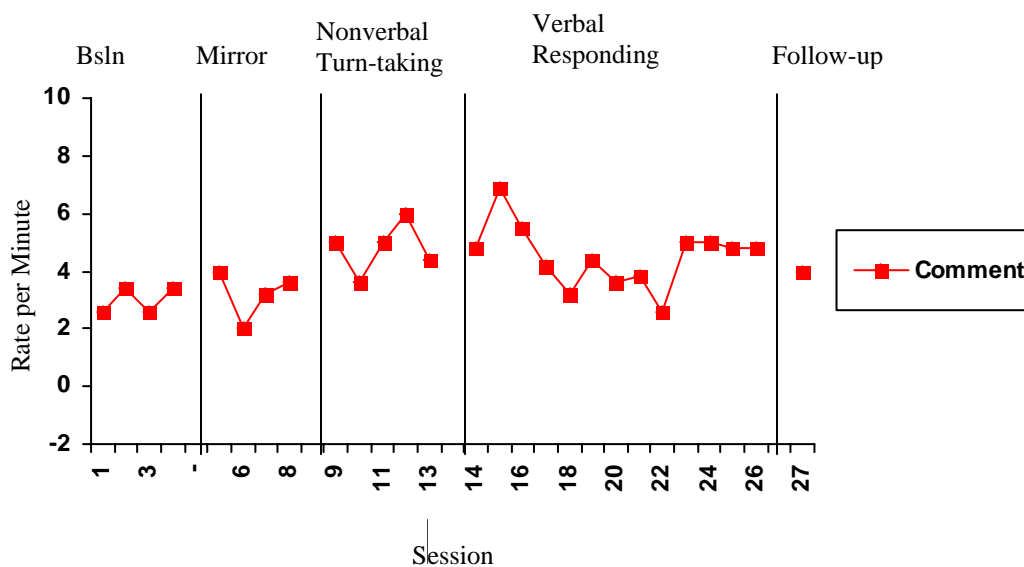
Figure 12. DS3's Rate of Commenting in Social Toy Activities

Prompts and praise. In social toy activities, baseline rates of interventionist's training and praise were at zero. For TS3, rates of praise and training increased slightly at the beginning of each phase. Rates of praise remained relatively stable across the mirroring training, nonverbal turn-taking training and responding training phases. Training levels increased slightly across each phase with the responding training phase

69

having the highest level of training. The second half of the responding training phase

showed a decelerating trend in training (See Table 14).

Table 14

Intervention Effects for Dyad 3 in Social Toy Activities

	Baseline M(SD)	Mirroring Training M(SD)	Nonverbal Turn-taking Training M(SD)	Responding Training M(SD)	Follow-up
Sibling Dyad 3					
Mirroring*	9.3(5.6)	61.8(6.7)	37.8(15.8)	37.5 (20.2)	16.7
Nonverbal Turn-taking*	0(0)	7.5(9.6)	26.0(11.6)	21.4 (19.2)	20
Mirroring + Nonverbal Turn-taking*	9.3(5.6)	66.8(12.8)	63.8(15.3)	58.9 (39.4)	36.7
Responding	1.6(0.3)	2.2(0.4)	1(0.5)	4.0 (1.2)	3.2
% Responsiveness	13.0(4.5)	11.3(8.7)	27.4(12.2)	56.8 (18.7)	19
Commenting	3.0(0.5)	3.2(0.9)	4.8(0.9)	4.5 (1.1)	4
Nonverbal Commenting	0(0)	0(0)	0(0)	0 (0)	0
Requesting	0.1(0.2)	0.3(0.3)	0(0)	0.1 (0.3)	0.2
Nonverbal Requesting	0.1(0.2)	0(0)	0(0)	0 (0)	0
Prompts	0(0)	0.6(0.1)	1.3(0.3)	1.5 (0.6)	0
Praise	0(0)	0.8(0)	0.7(0.3)	0.9 (0.4)	0

*Mirroring and nonverbal turn-taking are total percent of intervals. All other behaviors are rate per minute.

Independent Toys and Shared-Product Routines

     Mirroring and nonverbal turn-taking. TS3's use of mirroring and nonverbal turn-taking during baseline with independent toy activities was low (See Figure 13). While the percent of intervals during which TS3 used mirroring and nonverbal turn-taking increased slightly during the mirroring and nonverbal turn-taking training phases, percentages were variable and remained below criterion level in most sessions. The percent of intervals during which TS3 used mirroring and nonverbal turn-taking increased during the verbal responding training phase. Data in this phase were variable with only 4 of 7 data points above criterion levels. TS3's use of mirroring and nonverbal turn-taking did not reach a stable criterion level performance until after the generalization training. During the generalization observation phase that followed generalization training, the percent of intervals during which TS3 used mirroring and/or nonverbal turn-taking remained above criterion levels.

     TS3's performance in the shared-product routines was similar to her performance in the independent toy activities (See Figure 13). TS3's use of mirroring and nonverbal turn-taking in shared-product routines was low throughout baseline. The percent of intervals during which TS3 used mirroring increased slightly during the mirroring training phase, but remained below criterion level. There was no change in nonverbal turn-taking from baseline to mirroring or nonverbal turn-taking training. Following the introduction of verbal responding training, the percent of intervals during which TS3 used mirroring and nonverbal turn-taking increased. The data, however, were variable with only a 2 of 7 data points above criterion level. Following the introduction of generalization training, TS3 reached criterion level on mirroring and nonverbal turn-

taking. While the data points were variable during the generalization observation phase, 4 of 5 data points were above the criterion level.

Verbal responding. During independent toy activities, TS3's use of verbal responding was low and variable. Levels of commenting and repeating were low during baseline, mirroring training, and nonverbal turn-taking training phases. Data from the second session of the verbal responding training phase, however, showed an increase in use of verbal responding followed by a decelerating trend throughout the remainder of the verbal responding training phase. With the introduction of generalization training, TS3 showed an immediate increase in her use of verbal responding. Although verbal responding was somewhat variable during the generalization observation phase, none of the data overlapped with baseline data. The phase ended with an accelerating trend. TS3's use of mirroring, nonverbal turn-taking, and verbal responding in the independent toy activities decreased slightly at the 1-mo follow-up, but remained above baseline levels (See Table 15).

During shared-product routines, TS3's verbal responding was low and variable throughout baseline, mirroring training, nonverbal turn-taking training, and verbal responding training. Verbal responding increased slightly following the introduction of the mirroring training phase, but returned to baseline levels when nonverbal turn-taking was trained. TS3's levels of verbal responding increased again in the responding training phase, but the phase ended with verbal responding at baseline levels and a decelerating trend. When generalization training was introduced, TS3 increased her use of verbal responding. TS3's verbal responding remained above baseline levels and continued to accelerate across the generalization observation phase. At the 1-mo follow-up, TS3's use

of mirroring and verbal responding remained well above baseline levels in the shared-product routines (See Table 16).

Percentage of responsiveness. TS3's percentage of responsiveness during independent toy activities remained below the criterion level throughout the baseline, mirroring training, and nonverbal turn-taking training phases (See Figure 13). Following the introduction of verbal responding training, TS3 showed a slight increase in percentage of responsiveness, but her performance remained variable with only 1 of 6 data points falling above the criterion level of 50%. Following the introduction of the generalization observation phase, TS3's percentage of responsiveness increased to the criterion level and maintained throughout the generalization observation phase. At the 1-mo follow-up, TS3's percentage of responsiveness remained above baseline levels in the independent toy activities (See Table 15).

TS3's percentage of responsiveness during shared-product routines was below the criterion level throughout the baseline, mirroring, and nonverbal turn-taking training phases (See Figure 7). Her percentage of responsiveness increased following the introduction of the verbal responding training phase, but was variable and below the criterion level during the remainder of the phase. TS3's percentage of responsiveness increased to above the criterion level following the generalization training; TS3's percentage of responsiveness was above the criterion level in the second observation session following generalization training. She continued to show high levels in percentage of responsiveness throughout the remainder of the phase. TS3's percentage of responsiveness remained above baseline levels at the 1-mo follow-up in the shared-product routine. (See Table 16)
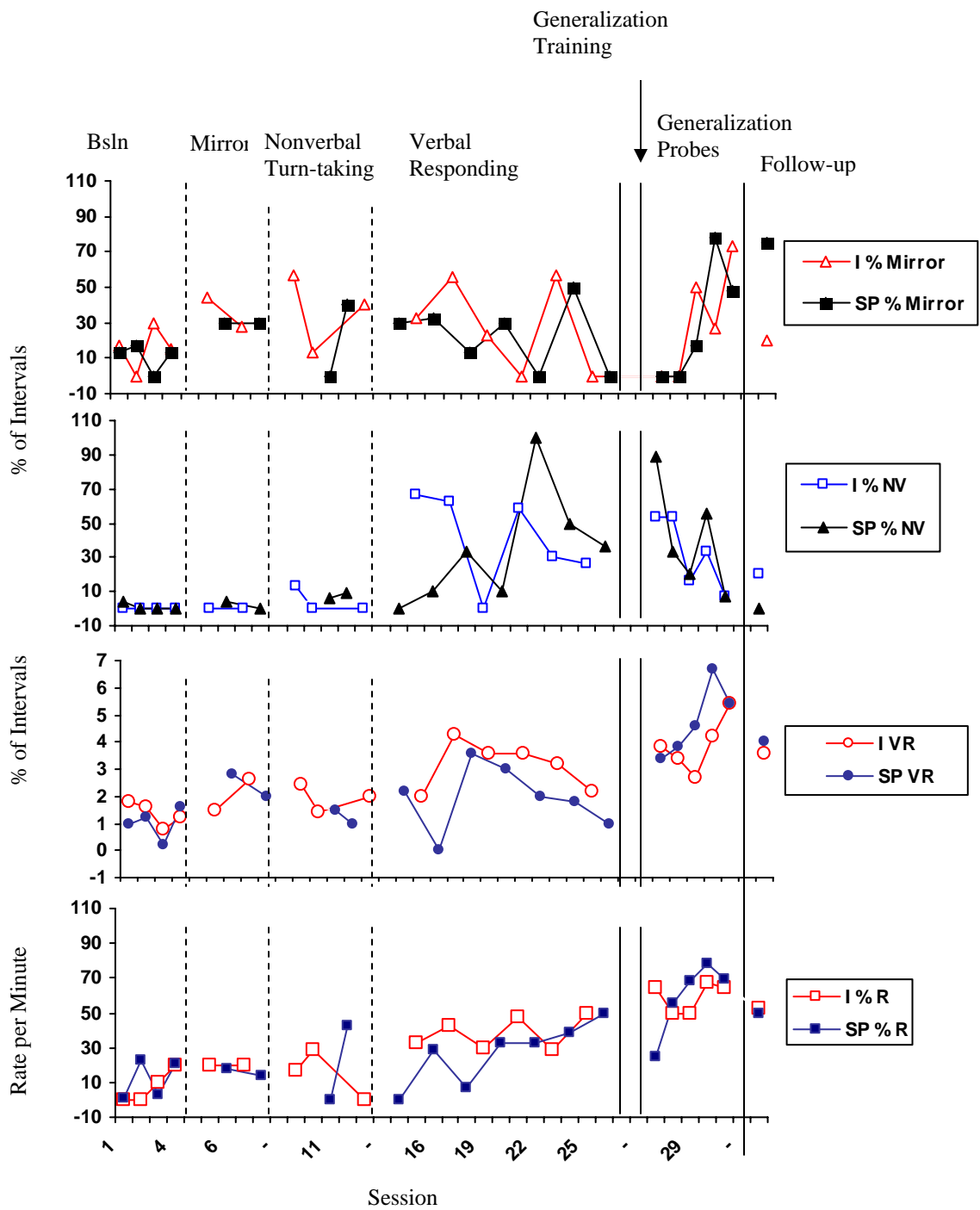
Figure 13 – TS3's Use of Mirroring (Mirror), Nonverbal Turn-taking (NV), Verbal Responding (VR) and Percentage of responsiveness (%R) during Generalization Probes, Independent Toy Play (I) and Shared-Product Routines (SP)

Sibling with a disability. Levels of verbal commenting by DS3 in independent toy activities were similar throughout the baseline, mirroring, nonverbal turn-taking, and responding phase averaging about 3 comments per minute (See Figure 14). Data during baseline and the responding phase, however, were more variable than the data during mirroring and nonverbal turn-taking training. DS3's rate of verbal commenting remained variable in the generalization observation phase. Two of four data points did not overlap with baseline data. DS3's rate of commenting in the independent toy activity was comparable to baseline and intervention levels at the 1-mo follow-up (See Table 15).

DS3's baseline level of verbal commenting was higher than the levels in the mirroring training and nonverbal turn-taking training phases in shared-product routines (See Figure 14). Following the introduction of the responding training phase, DS3's rates of commenting gradually increased to a level comparable to baseline. Data from the generalization observation phase suggest an increase in rates of verbal commenting in the last two sessions; the last two sessions of the generalization observation phase were above the baseline level. During the generalization observation phase, DS3's verbal commenting averaged about 4.5 comments per minute. DS3's rate of commenting was comparable to baseline and intervention levels at the 1-mo follow-up (See Table 16)
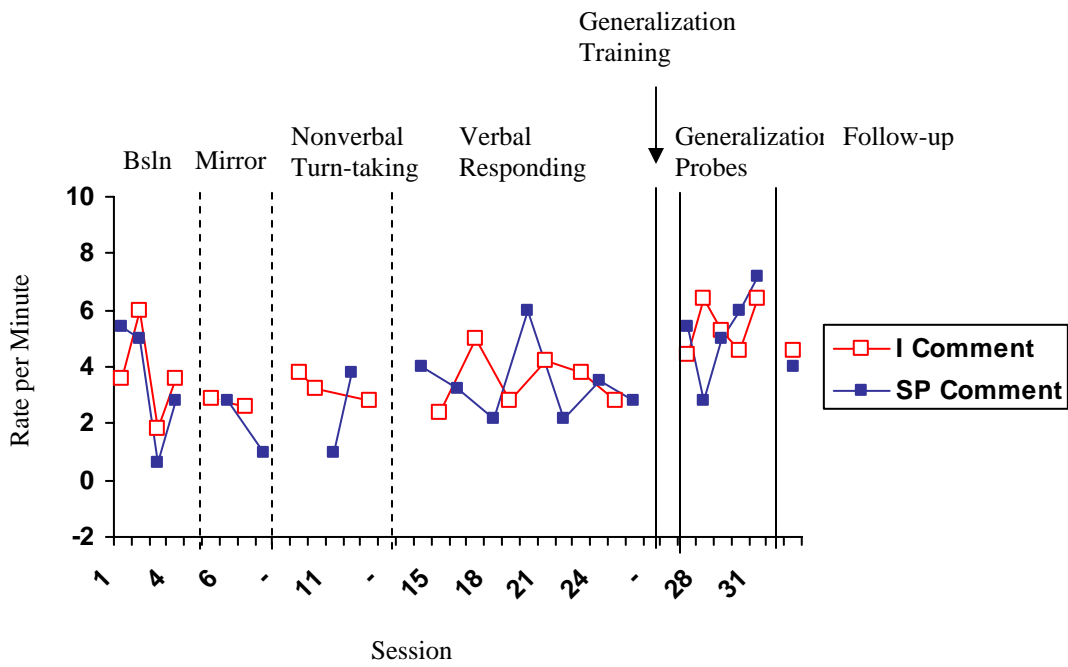
Figure 14 – DS3's Rate of Commenting in Independent Toy Activities (I) and Shared-Product Routines (SP)

Table 15

Intervention Effects for Dyad 3 in Independent Toy Activities

	Baseline M(SD)	Mirroring Training M(SD)	Nonverbal Turn-taking Training M(SD)	Responding Training M(SD)	Generalization M(SD)	Follow-up
Sibling Dyad 1						
Mirroring*	20.0(15.0)	35.7(11.8)	36.7(22.2)	28.2 (25.4)	30.02(32.0)	20
Nonverbal Turn-taking*	0(0)	0(0)	4.3(7.5)	31.3 (25.2)	32.66(21.1)	20
Mirroring + Nonverbal Turn-taking*	20.0(15.0)	35.7(11.8)	41.0(28.5)	59.5 (50.6)	62.68(53.1)	40
Responding	1.7(0.5)	2.1(0.8)	2.0(1.2)	2.8 (1.2)	18.4(6.9)	3.6
% Responsiveness	7.5(9.6)	0(0)	5.7(9.8)	38.8 (9.3)	59.4(8.6)	52
Commenting	3.8(1.7)	2.9(0.4)	2.3(2.0)	3.5 (1.0)	5.42(1.0)	4.6
Nonverbal Commenting	0(0)	0(0)	0(0)	0 (0)	0(0)	0
Requesting	0.3(0.4)	0.2(0.3)	0(0)	0.1 (0.2)	0.04(0.09)	0.4
Nonverbal Requesting	0(0)	0(0)	0(0)	0.3 (0.7)	0(0)	0
Prompts	0(0)	0(0)	0(0)	0 (0)	0(0)	0
Praise	0(0)	0(0)	0(0)	0 (0)	0(0)	0

*Mirroring and nonverbal turn-taking are total percent of intervals. All other behaviors are rate per minute.

Table 16

Intervention Effects for Dyad 3 in Shared-Product Routines

	Baseline M(SD)	Mirroring Training M(SD)	Nonverbal Turn-taking Training M(SD)	Responding Training M(SD)	Generalization M(SD)	Follow-up
Sibling Dyad 3						
Mirroring*	8.3(7.9)	29.8(0.3)	0(0)	22.3 (18.6)	28.52(33.8)	75
Nonverbal Turn-taking*	1.8(3.5)	3.5(4.9)	7.5(2.1)	42.4 (34.0)	40.9(32.3)	0
Mirroring + Nonverbal Turn-taking*	10.1(7.2)	33.3(4.7)	7.5(2.1)	64.7 (52.6)	69.42(66.1)	75
Responding	0.9(0.7)	2.4(0.6)	1.3(0.4)	3.0 (2.9)	4.77(1.3)	4
% Responsiveness	15.3(9.0)	19.0(5.7)	0(0)	27.8 (13.3)	59(20.7)	50
Commenting	3.5(2.2)	2.8(0)	1.0(0)	3.7 (1.2)	5.28(1.6)	4
Nonverbal Commenting	0(0)	0(0)	0(0)	0 (0)	0(0)	0
Requesting	0.4(0.6)	0.3(0.4)	0(0)	0.3 (0.4)	0.04(0.09)	0
Nonverbal Requesting	0(0)	0(0)	0(0)	0 (0)	0(0)	0
Prompts	0(0)	0(0)	0(0)	0 (0)	0(0)	0
Praise	0(0)	0(0)	0(0)	0 (0)	0(0)	0

*Mirroring and nonverbal turn-taking are total percent of intervals. All other behaviors are rate per minute.

Linguistic Measures

Following completion of intervention, the siblings with disabilities were post-tested using the two language measures given at the pre-test, a language sample and yhe PPVT. DS1 and DS3 both showed improvements on the PPVT as well as on MLU and diversity of words (See Table 17). DS2 did not show improvement on those measures. His PPVT score remained the same and his MLU and diversity levels decreased slightly. This is not surprising due to the fact that DS2 had a limited number of intelligible utterances throughout the intervention.

Table 17

Linguistic measures

Dyad	PPVT Standard Score		MLU		Diversity	
	Pre	Post	Pre	Post	Pre	Post
Dyad 1	83	88	2.20	2.28	97	110
Dyad 2	40	40	1.09	1.09	24	12
Dyad 3	83	96	1.76	2.03	67	81

Sequential Analysis

The primary research questions in this study focused on whether RI training changed siblings' behavior in training and generalization contexts. A secondary question was whether the sequential relationship between behaviors of the typical siblings and the siblings with disabilities was strengthened over time. Time-based sequential analysis

procedures were used to investigate whether or not there was a sequential relationship between turns taken by the siblings with disabilities and turns taken by the typical siblings.

The first set of analyses were done with all turns (i.e., verbal and nonverbal) taken by the siblings with disabilities as the antecedents and all verbal turns (i.e., comments and repeats) taken by the typical siblings as the target. The time window was set at 6 s. Thus, the analyses determined the probability that the antecedent behavior (i.e., behavior of the sibling with a disability) was followed by the target behavior (i.e., behavior of the typical sibling) within the 6 s time window (Table 18). The sequential relationship between turns taken by the siblings with disabilities and the typical siblings in social toy activities increased from baseline to the 2nd half of the verbal responding phase for all three dyads.

Results in the independent toy activities are somewhat inconclusive. For Dyad 1 and Dyad 2, the Yule's Qs in the baseline, mirroring, and nonverbal turn-taking training phases included expected frequencies of less than five. For Dyad 3, the sequential relationship increased from the responding phase to the generalization observation phase.

Results in the shared-product routine activities are also somewhat inconclusive. For Dyad 1 and Dyad 2, the Yule's Qs in the baseline, mirroring, and nonverbal turn-taking training phases included expected frequencies of less than five. Thus, as with the independent play activities, the estimate of Yule's Q for the association between the behaviors of the typical siblings and the siblings with disabilities is not accurate. For Dyad 3, the sequential relationship increased from the responding phase to the generalization observation phase.

Table 18

Yule's Q: Given=DS; Target=TS

	Dyad 1			Dyad 2			Dyad 3		
	Social Activities	Independent Activities	Shared Activities	Social Activities	Independent Activities	Shared Activities	Social Activities	Independent Activities	Shared Activities
Baseline	*-0.34	.006	*0.16	*0.15	*0.55	*0.14	*0.29	*0.55	0.34
Mirroring Training	*0.19	*-0.25	*0.19	*0.27	*0.60	*0.61	*0.17	*-0.12	*0.22
Nonverbal Turn-taking Training	0.20	*0.58	*0.39	*-0.10	*0.75	*0.86	*.007	*0.47	*0.27
1st Half of Verbal Responding Training	0.49	N/A	N/A	0.42	N/A	N/A	0.20	N/A	N/A
2nd Half of Verbal Responding Training	0.64	N/A	N/A	0.52	N/A	N/A	0.54	N/A	N/A
Total Verbal Responding Training	0.56	0.67	0.54	0.48	0.54	0.59	0.37	0.29	.0005
Generalization Probes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.53	0.43

Note: (*) indicates cells with expected frequencies of 5 or less

The second set of analyses were done with all verbal turns (i.e., comments and repeats) taken by the typical siblings as the antecedents and all turns (i.e. verbal and nonverbal) taken by the siblings with disabilities as the targets. The time window was set at 6 s. Thus, the analyses determined the probability that the antecedent behavior (i.e., behavior of the typical sibling) was followed by the target behavior (i.e., behavior of the sibling with a disability) within the 6 s time window (Table 19). These analyses resulted in variable patterns across sibling dyads and phases of intervention.

In social toy activities, Yule's Qs in baseline, mirroring training, and nonverbal turn-taking training included expected frequencies of less than five. For Dyad 1 and Dyad 3, the sequential relationship showed an increase from the 1st half to the 2nd half of the verbal responding training phase, but the relationship was the highest in the mirroring training phase. Dyad 2, the sequential relationship with social toy activities showed no change from the 1st half to the 2nd half of the responding training phases.

With independent toy activities, most Yule's Qs in baseline, mirroring training, and nonverbal turn-taking training included expected frequencies of less than five. Dyad 1 showed a decrease in the sequential relationship between turns taken by the typical siblings and the siblings with disabilities from baseline to the responding training phase. The sequential relationship for Dyad 2 was inconclusive. Dyad 3 showed a decrease in the sequential relationship between the two sets of behaviors from the responding training phase to the generalization observation phase. .

Results in the shared-product routine activities are inconclusive. For Dyad 1 and Dyad 2, the Yule's Qs in the baseline, mirroring, and nonverbal turn-taking training phases included expected frequencies of less than five. For Dyad 3, the Yule's Qs in

baseline, mirroring training, nonverbal turn-taking training, and verbal responding

included expected frequencies of less than five.

Table 19

Yule's Q: Given=TS; Target=DS

	Dyad 1			Dyad 2			Dyad 3		
	Social Activities	Independent Activities	Shared Activities	Social Activities	Independent Activities	Shared Activities	Social Activities	Independent Activities	Shared Activities
Baseline	*0.57	0.54	*0.34	*0.45	*.006	*0.18	*0.28	*0.47	0.27
Mirroring Training	*0.56	*.007	*0.54	*0.52	*0.29	*0.84	*0.43	*0.13	*-0.12
Nonverbal Turn-taking Training	0.27	*-1	*.008	*0.26	*0.39	*0.41	*.009	*0.30	*0.25
1st Half of Verbal Responding Training	0.27	N/A	N/A	0.33	N/A	N/A	.004	N/A	N/A
2nd Half of Verbal Responding Training	0.37	N/A	N/A	0.33	N/A	N/A	0.34	N/A	N/A
Total Verbal Responding Training	0.33	0.48	0.44	0.29	0.38	0.39	0.20	0.54	*0.42
Generalization Probes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.44	0.41

Note: (*) indicates cells with expected frequencies of 5 or less

CHAPTER IV

DISCUSSION

The results of this study extend the literature on teaching siblings to implement intervention strategies with their brothers and sisters with disabilities. In addition, results of the study extend the literature on programming for generalization across contexts. Results of the study and how they extend the research literature are discussed below. Then, variables affecting typical siblings' acquisition of RI strategies, implications for practice, implications for research, and limitations of the study are discussed.

Summary of Results

Typical Siblings in Social Toy Activities

All three older siblings learned the responsive interaction techniques. Within the social toy context, typical siblings demonstrated use of the RI strategies across three different social toy activities. Two of the three sibling dyads, TS1 and TS2, demonstrated immediate improvements in their use of responsive interaction strategies. One sibling, TS3, however, required a greater number of sessions to reach criterion levels of performance. TS1 required 19 intervention session and TS2 required 18 intervention sessions to reach criterion level performance in the social toy activities. TS3 required 22 intervention sessions to reach criterion level performance. Changes in the typical siblings' use of responsive interaction strategies maintained above the baseline levels at

the 1-mo follow-up for TS1 and TS2. Follow-up data for TS3 indicated a return to baseline level at the 1-mo follow-up.

The typical sibling results of this study further extend the literature on teaching siblings to implement intervention strategies with their younger brothers and sisters with disabilities. Specifically, the results extend the literature on teaching siblings to use RI strategies. In general, this study supports the conclusions of previous studies on siblings as interventionists (Swenson-Pierce et al., 1987; James & Egel, 1986; Celiberti & Harris, 1993; Hancock & Kaiser, 1996; Tekin & Kircaali-Iftar, 2002; Trent et al., 2005; Trent et al., in press).

Siblings with Disabilities in Social Toy Activities

The measures of the communicative performance of the children with disabilities revealed some increases in the number of comments made by the children in each session. DS1 and DS2 showed a slight increase in their rate of commenting from baseline to the end of intervention in both generalization contexts and DS3 demonstrated a slight increase in his rate of commenting from baseline to the end of intervention in the social toys context. Communicative behaviors of all three siblings with disabilities were comparable to intervention levels at follow-up. There was no change in requesting for any of the siblings with disabilities. Requesting, however, was not targeted in this intervention.

DS1 and DS3 demonstrated improvement in MLU, diversity of vocabulary, and PPVT scores from pre- to post-intervention. DS2 did not demonstrate improvements on these language measures. DS2, however, began the intervention with a much lower MLU,

86

diversity of vocabulary, and PPVT score than DS1 and DS3. DS2's communicative

efforts consisted primarily of unintelligible utterances, while DS1 and DS3 typical used

intelligible 2- to 4-word utterances. DS2 also had fewer intelligible utterances than DS1

and DS3 at the start of intervention. At the beginning of intervention, most of DS2's

verbal utterances were unintelligible. Intelligible utterances seemed to increase slightly

following intervention, but were still relatively low.

Siblings' Performances in Generalization Contexts

All three typical siblings learned to use the responsive interaction strategies in

three different contexts, social toys, independent toys, and shared-product routines.

Within each of the three contexts, typical siblings demonstrated use of RI strategies in

three different activities. Two of the typical siblings, TS1 and TS2, generalized use of RI

strategies without explicit training in those activities. The prompt to "remember to use the

strategies we have been talking about" before each generalization activity was sufficient

to promote generalization for these two siblings. TS3 generalized use of RI strategies

following explicit training in the generalization contexts. Generalization training,

however, was brief (i.e., two 1- hour sessions) and did not extend her participation in the

intervention by a significant amount of time. Thus, it appears that this intervention, even

with generalization training, is an efficient strategy for promoting interaction skills in a

variety of contexts. Efficiency is especially important given the busy schedules of most

families of children with disabilities.

The generalization results of the study extend the literature on programming for

generalization across contexts. Research on general-case programming suggests that

teaching should take place within settings/events that are functional for individuals (Horner & Albin, 1988). The assumptions about learning that are put forth by general-case programming were applied in this study. Contexts that were functional for the typical siblings and the siblings with disabilities were selected as training and generalization contexts. In the present study, siblings participated in activities from three different contexts, social toys, independent toys, and shared-product routines. These contexts were selected because they were contexts in which siblings routinely participated but did not frequently communicate. Teaching typical siblings to use RI strategies in settings that were familiar and functional to both of them increased the probability that the behaviors will generalize.

Implementation of RI strategies in functional settings and activities also increases the probability that the communicative behaviors acquired by the siblings with disabilities will generalize. In the current study, siblings participated in three different activities within each of three different contexts (i.e., social toy activities, independent toy activities, and shared-product routines). Thus, siblings interacted in nine different activities during which the typical siblings provided the children with disabilities with a variety of context specific models.

The level of support necessary to promote generalization was also considered in this study. In the previous research on sibling generalization of RI strategies (Trent et al., in press), typical siblings were not given any instructions, coaching, or feedback regarding their use of RI strategies in contexts outside of the training context. In an attempt to better understand the level of support and training needed to support generalization, the current study included a plan for two levels of support. First, siblings

were reminded to use the RI strategies during each generalization activity. When the reminder alone was not effective for promoting generalization in Dyad 3, the typical sibling was provided with explicit instructions about how to use the RI strategies in other contexts as well as feedback regarding her performance in these contexts.

Sequential Analysis

For all three dyads, sequential analyses with the behaviors of the siblings with disabilities as antecedents and the typical siblings' behaviors as targets suggested that the association between the behaviors of typical siblings and siblings with disabilities was more than one would expect by chance alone. The associations showed the greatest increases during the 2nd half of the responding training phases. This may have been a result of the increased rates of verbal responding by the typical siblings. For Dyad 1 and Dyad 2, sequential analyses conducted with the typical sibling behaviors as antecedents and the behaviors of the siblings with disabilities as target suggested that the association between the behaviors of the typical siblings and the siblings with disabilities was more than one would expect by chance alone. The slight changes observed in sequential associations across intervention conditions may be due to the fact that the intervention was too brief to show significant effects on the communicative behavior of the siblings with disabilities. Furthermore, the performance of the siblings with disabilities was not directly targeted as was the performance of the typical siblings.

Age of Siblings

This study was the third in a series of studies on teaching older siblings to use responsive interaction strategies. Based on both data and clinical experiences with the siblings who participated in these studies, a few conclusions may be drawn regarding characteristics of older siblings and their families that interact with the effectiveness of the RI intervention. Siblings who are close in age (i.e. within 2 to 3 years), tend to enjoy playing more together and share more common interests in toys and activities. For example, Dyad 1 had many similar interests and both children enjoyed the activities selected for intervention sessions. Dyad 3, on the other hand, had more difficulty selecting activities that they both enjoyed. Furthermore, even when an activity was agreed upon, their ways of participating in the activity were often very different. For example, when playing with a farm set, TS3 often wanted to engage in an elaborate episode of pretend play while DS3 preferred simpler manipulation of the toys.

Play Skills of Siblings with Disabilities

Second, level of play skills of the younger siblings influenced the ease with which the older siblings were able to use the responsive interaction strategies. For example, while DS1 needed prompting for play (i.e., directions for engaging in play), he was primarily able to participate in each activity at a level comparable to his older brothers. DS2, however, was at a much lower level of play than his older sister, especially during social and pretend play activities (i.e., he would often only mouth or hold objects). While

his older sister was still able to use the strategies during intervention sessions, she lacked the skills to scaffold her brother's play into an interaction that was more age appropriate and enjoyable for her.

Family Stress

Other issues that seem to affect the ease with which older siblings learn and use the intervention family size and family stress. At the time of the study, TS2 had one younger brother with Down syndrome and an infant sister. TS1 had only one younger brother with Down syndrome. Dyad 1 and Dyad 2's mothers did not work outside of the home. TS3, however, had three younger siblings, two with an autism diagnosis. Both her mother and her father worked outside of the home and her father often worked nights. Family schedules, demands, and stress may have placed more responsibilities on TS1 and given her less parental attention and support. Her ability and interest in participating in the intervention may have been affected.

Following the completion of intervention, the mothers of each dyad were asked to complete the Parenting Stress Index (Abidin, 1995). The mother of Dyad 3 reported significantly more stress related to her child with autism, DS3, than the mothers of Dyad 1 and Dyad 2 reported for their children with disabilities. While the total stress scores for the mothers of Dyad 1 and Dyad 3 were comparable, the mother of Dyad 2 scored significantly lower stress. In future research, it may be useful to consider screening families for demands and stress as well as screening siblings for age and play skill level differences.

Implications for Practice and Research

Practice

The implications of this research for practitioners are numerous. Teaching typical siblings strategies to facilitate interactions with their brothers/sisters with disabilities is likely to improve the quality of the time that siblings spend together. When typical siblings know how to interact with their younger siblings with disabilities, they are more likely to enjoy interacting with their younger brothers/sisters. Social validity was not assessed in this study. In previous studies (Trent et al., 2005; Trent et al., in press), however, social validity was assessed. In these two studies, parents of children with Down syndrome (Trent et al., 2005) and master's level students in early childhood special education (Trent et al., in press) rated baseline video clips of sibling interactions and video clips from the end of intervention on components such as reciprocity, enjoyment, and positive attitudes. Both parents and students rated post-intervention clips as more reciprocal and positive that pre-intervention clips.

Following the completion of intervention, informal exit interviews were conducted with the typical siblings from Dyad 2 and Dyad 3, TS1 was not available to participate. During the interviews, TS2 and TS3 reported that they enjoyed participating in the study and learning new ways to interact with and help their younger brothers. The two siblings also reported that there favorite part of the study was the time they spent playing with their brothers with Down syndrome. A standardized measure of engagement and/or joint attention may have shown additional changes in the siblings interactions.

Children with disabilities are also likely to benefit from increased interactions with their older, typically developing brothers and sisters. While improvements in language skills for the sibling with disabilities were slight, evidence of improvement suggests that this intervention may aid language development for children with disabilities. The fact that improvements were observed without the use of prompting or manding strategies is encouraging. The typical siblings were taught to respond to verbal and nonverbal attempts at communication made by their younger siblings with disabilities. Further, they were taught to respond by either repeating what was said by their younger siblings or commenting on the ongoing activity. All three siblings primarily used commenting to respond to their younger siblings. Thus, activity appropriate vocabulary and syntax was continuously modeled for the siblings with disabilities throughout the intervention phases.

Continued use of the responsive interaction strategies by the older siblings may result in significant improvements in the vocabulary and syntax skills of their younger siblings. One can reason that interactions between children with disabilities and typically developing children provide increased opportunities for the indirect teaching of communicative behaviors. Clinical practitioners, home visitors, and teachers could use strategies such as these to involve siblings in the numerous visits they attend with their brothers and sisters with disabilities (Abramovich, 1986).

Research

Results of the research on siblings' use of RI strategies leave several questions for future researchers to investigate. First, future researchers should consider developing a

strategy for screening typical siblings for participation in the intervention. It is hypothesized that some siblings will benefit from an intervention such as RI but that other siblings may benefit more from sibling support programs (i.e., Sibshops, peer buddies). For a family with high levels of stressors, like Dyad 3, typical siblings are likely to benefit more from the supports mentioned above. A screening assessment should be developed to assess certain issues that might influence a sibling's ability to participate in the RI intervention (i.e., time spent with friends, amount of free time, demands for caregiving, interest in sibling with a disability).

Second, it is important necessary to determine how best to train interventionists to teach typical siblings. Across three RI studies, 8 typical siblings have been taught to use RI strategies. Seven of the eight siblings were taught by the same interventionist. Future researchers should consider how other professionals can be trained to teach typical siblings how to use RI strategies with their younger siblings with disabilities. Interventionists need to have experiences with typical children and children with disabilities. Interventionists also need to have an understanding of the issues and concerns (i.e., jealousy, guilt) that often arise for siblings of children with disabilities. Knowledge of language development and the components of the RI intervention are also important. Finally, interventionists need skills and experience providing live coaching and feedback; coaching and feedback during intervention sessions has to be specific and immediate.

Third, relatively little is known about the effect of the intervention on the sibling with a disability. Communication skills were assessed in each of the RI studies, but little is known about how much the sibling with a disability liked or disliked participating in

the study or if they increased the amount of time spent with their typical siblings as a result of the intervention. Future research might use questionnaires designed to assess the sibling with a disability's opinion of the intervention. Parents might also be involved in assessing the impact of the intervention on the sibling with a disability. Parents might be asked to complete daily report forms on the amount of time siblings' are spending together and the quality of those interactions. Measures of engagement and joints attention might also be added to determine the effect of the intervention on the siblings with disabilities.

Next, more maintenance data are needed to determine whether typical siblings can continue using RI strategies without support from the interventionist. In this study and previous study, siblings demonstrated the ability to use RI strategies at 1-mo follow-up assessments. Future research may consider assessing maintenance at a later interval (i.e. 3 mos, 6 mos) and/or having someone other than the interventionist conduct follow-up assessments. The presence of the interventionist may serve as a discriminative stimulus for the typical siblings. If siblings are expected to use the RI strategies over time and in different settings, it is important to determine whether or not they can use the strategies when presented with different stimuli. Also, future research might use the self-management and self-evaluations worksheets used in this study as a strategy for training maintenance. The interventionists could leave worksheets for the typical sibling to continue completing on a daily basis following the completion of intervention. Use of the worksheets might then be gradually faded out.

Future research might also consider involving parents and/or peers in the RI intervention. Parents could be taught to implement the RI strategies and to teaching their

typical children to use the RI strategies with their siblings with disabilities. This may facilitate generalization and maintenance of intervention effects. The results of the study also have implications for the use of RI strategies with peers. Peers are another source of modeling for children with disabilities. Typical peers could be taught to use RI strategies with children with disabilities in the classroom. Not only would this increase the number of interactions between typical peers and children with disabilities, but it would also provide the children with disabilities with additional social and communicative practice and models.

Finally, the use of RI strategies by siblings has only been studied in one research lab. This limits the generalizability of the results. The studies need to be replicated and extended in other labs before conclusions can be confirmed.

Limitations

The results of the study are generally encouraging. There are a few methodological limitations, however, that should be addressed. First, the intervention is time consuming for both the interventionist and the participating families. Approximately 20 hrs per weeks were necessary to conduct the interventions sessions and code and summarize the data. Participating families had to be willing and able to commit approximately 4 hrs per weeks over a period of about 3 to 4 mos for the interventionist to come into their homes. This period would be shortened in practice because a baseline would not be necessary. Still, not all families or practitioners have the time or resources to commit this amount of time.

A second limitation concerns the skills of the interventionist. The interventionist in this study had significant experiences working with parents, siblings, and children with disabilities around language interventions (i.e., milieu teaching and responsive interaction). The interventionist was very familiar with RI and had taught five other siblings the intervention. The interventionist also had experience working with siblings in programs like Sibshop, workshops for siblings of children with disabilities. Future interventionists may require similar experiences to be successful in implementing the sibling RI intervention. As mentioned above, future research is needed on the skills needed to be a sibling interventionist and how to train sibling interventionists.

A third limitation concerns the presence of the interventionist during generalization and maintenance assessments. As mentioned in implications for research, the interventionist was present at the follow-up assessment. She was also present at all baseline and intervention sessions. It is unknown what affect the presence of the interventionist alone may have had on the ability of the siblings to use the RI strategies. It is also unknown whether siblings used the RI strategies when the interventionist was not present. Future research may consider strategies to assess siblings' use of RI strategies in the absence of the primary interventionist.

Finally, informal consumer feedback was obtained from TS1 and TS2. TS3, however, was unable to participate in this post-intervention assessment. Given that TS3 had the most difficulty implementing the RI strategies, it may have been informative to learn how she felt about participating in the intervention and what she thought she had learned. Future researchers might consider assessing siblings' perspectives of the intervention throughout the intervention rather than waiting until the intervention is over.

Conclusion

In summary, results of this study suggest that siblings of children with disabilities can learn to implement RI strategies in multiple contexts. Not only did the typical siblings learn to implement the RI strategies in the training context (i.e., social play), but they also learned to implement the strategies in two generalization contexts (i.e., independent toys and shared-product routines). Within each context, siblings practiced using the RI strategies in three different activities; siblings practiced the use of RI strategies in 9 different activities. Thus, typical siblings had the opportunity to practice RI strategies in a variety of activities and the siblings with disabilities had the opportunity to hear and practice language specific to each of these activities. Results also suggest that interventions such as the RI intervention may promote more reciprocal and positive interactions between siblings.

Thus, it appears that when a formal teaching program is used with siblings of children with disabilities, it may foster and/or strengthen positive interactions between siblings across a variety of home settings. It also may enhance the development of positive attitudes between siblings and lessen the learning problems and skill deficits experienced by the child with a disability through increased instructional time with siblings. Further, sibling-based interventions may enhance the generalization of learned skills from the school setting to the home and from interactions with teachers to interactions with family members (Powell & Gallagher, 1993a, 1993b). Further research, however, is needed to verify these hypotheses.

While there may be disadvantages to involving siblings in interventionist type roles, the benefits for both siblings may be numerous. Disadvantages of training older

siblings are most likely to occur when one sibling does not want to participate, when participation makes the relationship appear unequal, or when the sibling exploits a child with a disability. With continued systematic investigation of both the specific and general effects that occur when siblings are involved in intervention, however, it will become more apparent whether this strategy is effective in facilitating the skill development of children with disabilities and in enhancing a positive interaction between siblings.

APPENDIX A

SOCIAL, INDEPENDENT, AND SHARED-PRODUCT ACTIVITY LISTS

Social and Pretend Play Activities

Dress-up

Dolls/dollhouse

Housekeeping

Pretend food
./,
Veterinarian

Doctor

Construction

Farm
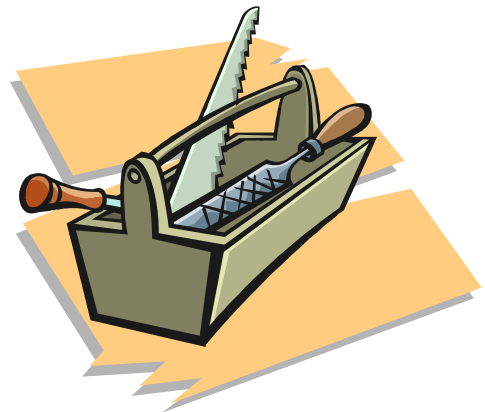
Independent Toys and Activities

Books

Paints/paintbrushes

Paper w/ scissors and/or markers

Peg boards

Ball chutes

Shape sorter

Puzzle

Play dough

Shared-Product Activities and Household Routines

Preparing a snack

Making a craft

Variations of the two

Set the table

Clean-up toys

Laundry: put in; take out

Dishwasher: put dishes in, take dishes out

Wash and dry dishes in sink

APPENDIX B

RESPONSIVE INTERACTION CODING MANUAL

RESPONSIVE INTERACTION CODING MANUAL

I.   CODE TYPICAL SIBLING MIRRORING OR NONVERBAL TURN-
      TAKING
II.   CODE TYPICAL SIBLING VERBAL RESPONDING
III. CODE SIBLING WITH DISABILITIES INTENTIONAL
      COMMUNICATION
IV.   CODE INTERVENTIONIST TRAINING AND PRAISE STATEMENTS

TYPICAL SIBLING BEHAVIORS

MIRRORING/NONVERBALTURN-TAKING CODE (PARTIAL INTERVAL)

STEP 1 –: MIRRORING
Does the typical sibling imitate an action of the child with a disability with
simultaneously or immediately following the action of the child with a disability (i.e.,
pretend to feed a doll with a bottle at the same time that the sibling with a disability is
pretending to feed a doll with a bottle)

NO	YES
Go to step 2	Code M and go to STEP 2

STEP 2 - NONVERBAL TURN-TAKING –
Does the typical sibling take a nonverbal turn at the same time or following a
nonverbal turn in a routine with the sibling with a disability (i.e., stack a block onto a
tower after the sibling with a disability stacks a block OR putting a dish in the
dishwasher after the sibling with a disability hands him/her the dish).
     Nonverbal turns can be with the same object/same action; same object/different
action, or different object, same action.

NO	YES
Go to step 3	Code N and go to STEP 3

RESPONSIVE INTERACTION CODE (EVENT RECODRING)

STEP 3 – TALK - Does the typical sibling say something?

NO	YES
Precede in tape	Go to STEP 4

STEP 4 – RESPONDING - Does the typical sibling verbalization follow a verbal or nonverbal act of intentional communication by the sibling with a disability or a 5 second pause?

Example:
TS: "I like play dough"
5-s pause OR turn by DS
TS: "Let's smash the play dough

NO	YES
Precede in tape	Go to STEP 5

STEP 5 – TYPE OF RESPONDING - Did the typical sibling repeat the exact utterances spoken by the sibling with a disability

Example:
DS: "baby's hungry"
TS: "baby's hungry"
5-s pause OR turn by DS

NO	YES
Go to step 6	Code "R" and proceed in tape

STEP 6 – TYPE OF RESPONDING – Did the typical sibling describe or comment on the ongoing activity or toys
DS: "xxx"
TS: "We're stacking blocks"
5-s pause OR turn by DS

NO	YES
Precede in tape	Code "D" and precede in tape

Intentional Communication Coding Manual

RESPONSIVE INTERACTION CODE (EVENT RECORDING)

Purpose of code: Derive the frequency of the following:

a. Intentional communication
   a. Comments
   b. Requests

Begin coding the session at the beginning of the first full minute.

STEP 1: Is there a communicative attempt (i.e., gesture, vocalizations, or sign) present? (no coding to be done)

- A gesture (There are two types of gestures but distinctions are not coded)

  - An unconventional gesture

    - A reach, give, show, clap, move sibling's hand, push or move object to sibling, contact point

  - A conventional gesture

    - A point (distal), a shoulder shrug, a head nod or head shake, a wave, the "shh" sign
    - A sign or pantomime (e.g. bumble bee pantomime)

- Any discrete voiced phonation (word or non-word)

- A complete word or sign

- Approximation to word or sign**:** Both exact productions and acceptable approximations of adult forms of the word are accepted.

STEP 2: Which of the 2 types of behavior do you see?

Verbal
   • Non-word vocalization
Nonverbal
   • Clap
   • Reach
   • Contact point
   • Move object to older sibling
   • Move sibling's hand
	Requires coordinated attention to be considered intentional communication
	
	Proceed to STEP 3

Verbal
   • Meaningful word or sign
Nonverbal
   • Any conventional gesture
   • Give
   • Show
   • Distal point
	Coordinated attention is implicit in these behaviors or a symbolic form is used
	
	Proceed to STEP 4

WHAT IS COORDINATED ATTENTION?
- **Attention to both sibling and object within 3 seconds of producing the non-word vocalization, reach, clap, contact point, push or move object to older sibling, or touch older sibling**

  - An event is an activity occurring in the room that may attract the child's attention, such as a balloon bursting or something falling off a shelf that is then shared with the older sibling

  - An object is any physical entity other than a person that is shared with the older sibling

  - Attention to object or event is seen by looking at or actively touching the object

  - Attention to older sibling is seen by looking at or actively touching the older sibling. Answering a question, imitating the older sibling's behavior

- Coordination of attention to object (or event) and older sibling

    - Can occur in any sequence (i.e., object then older sibling or older sibling then object)
    - Attention to object and attention to older sibling has to occur within 3 second of each other

- If potential act is still considered intentional communication, proceed to STEP 3

STEP 3: Separation of communication acts (i.e., segmenting) (no coding to be done): if the situation matches one or more of the following AND both clusters of behavior meet the criteria for "intentional communication act", then code the clusters of behaviors as two acts

- The clusters are separated by 3 or more seconds (counted as 1001, 1002, 1003)

- The clusters are separated by an older sibling communication act.

- The child's focus of attention is on a new referent (i.e, the communication act is about a new "topic")

- The clusters in question have different functions (i.e. requests, comments, or other). *Note: Do not code as two acts just because the child's affect changes

STEP 4: Does the act request action or object or continue a halted turn-taking routine?
If yes, code Q.
If no, continue decision making process

*Note: If it is not clear whether the communicative function is a comment or a request, code as a comment.

Requesting behaviors have the pragmatic function of…
- Maintaining turn-taking or ongoing routine
- Requesting help or comfort, or
- Eliciting an action or object from the older sibling

Request action
Request object
Request help
Maintain turn-taking
Maintain ongoing routine
Request comfort
Request label

If any of these, code as a NONVERBAL (W) OR VERBAL REQUEST (Q)

STEP 6: Does the act direct older sibling attention or share interest?
If yes, code V or C

Commenting behaviors have the pragmatic function of ONE of the following:

- Sharing positive affect about an object/event

- Requesting or giving an object/event label

- Directing the older sibling's attention to an interesting object or event

Direct older sibling attention
Share positive affect
Share interest
Provide label

INTERVENTIONIST BEHAVIORS

RESPONSIVE INTERACTION CODE (EVENT RECORDING)

STEP 1 – INTERVENTIONIST TALK - Does the interventionist say anything?
    a. If yes, precede to STEP 2
    b. If no, continue observation

STEP 2 – TYPE OF INTERVENTIONIST TALK - Is the interventionist's comment to provide teaching or praise?
    c. Interventionist Teaching (T)
        i. Count frequency of interventionist teaching: when the interventionist givens the TS feedback that instructs him/her on how to respond, follow through, or carry out the intervention in some way
        ii. Praise or neutral comments from the interventionist is not interventionist teaching
    d. Interventionist Praise (P)
        i. This category consists of any encouraging comments from the teacher directed at either the DS or the TS

Table of Codes

Mirroring	M
Nonverbal turn	N
Repeat	R
Describe	D
Nonverbal Comment	V
Verbal Comment	C
Nonverbal Request	W
Verbal Request	Q
Training	T
Praise	P

APPENDIX C

PROCEDURAL FIDELITY CHECKLIST

Procedural Fidelity Checklist

- For baseline and RI training session, all items should be completed except for item #7 and item #16 is optional
- For generalization training sessions, all items should be completed
- For generalization probes, only item #7 and #15 should be completed

Item	Yes	No
TEACH		
1. Does the interventionist ask the typical sibling what he/she thinks it means to mirror, respond to verbalizations, or respond to gestures (depending on what phase of intervention the siblings are in)?		
2. Does the interventionist clarify the typical sibling's definition of mirroring, responding to verbalizations, or responding to gestures?		
3. Does the interventionist discuss mirroring, responding to verbalization, or responding to gestures using the training manual?		
4. Does the interventionist use role play?		
5. Does the interventionist model examples and non-examples: Have the typical sibling tell him/her **when** he/she is correct and incorrect and **why?**		
6. Does the interventionist prompt for questions from the typical sibling?		
7. Does the interventionist have the typical sibling complete a "how to work with my brother/sister" and/or "how to play with my brother sister" worksheet prior to practice		
PRACTICE		
8. Does the interventionist instruct the typical sibling to practice mirroring, responding to verbalizations, or responding to gestures with his/her younger sibling?		
9. Does the interventionist remind the typical sibling to continue use of previously learned strategies?		
10. Does the interventionist limit prompts to two per minute?		
11. Does the interventionist limit praise to two per minute?		

FEEDBACK		
12. Does the interventionist provide immediate feedback about what went well and what still needs some work?		
13. Does the interventionist discuss goals for the next session with the typical sibling?		
14. Does the interventionist plan for activities for the next session with the typical sibling?		
15. Does the interventionist end on a positive note? (i.e. with lots of praise)		
16. Does the interventionist have the typical sibling complete a self-evaluation worksheet		

APPENDIX D

SIBLING STORY PROTOCOL

Protocol for Sibling Stories

Before the session with the sibling:

1. Tell the sibling a little about what you will be doing in the interview (telling her family's story and the story of the child with a disability; talking together about the sibling's strengths, needs, skills and challenges as well as the child with a disability's strengths, needs, skills, and challenges)
2. Make an appointment at a convenient time for about 1½ hours. Choose a time when both you and the sibling can be relaxed and focused on the interview.
3. Get the needed equipment together for the interview: chart paper and pens, tape or video recorder, blank tapes, child's assessment file.

Introductory Comments to the Sibling:

- Story telling is a way for us to get to know you and your brother/sister better.
- It helps us to understand who you and your brother and sister are.
- It allows us to see you as a special individual and your relationships with your brother/sister.
- It helps both the sibling and the interviewer understand what is important in his/her life and in his/her relationships with their brother/sister with a disability.
- It helps us to understand how you talk to your brother/sister and how he/she talks to you.
- We have done stories with other brothers and sisters and we have done stories about our own families (possibly relate some of the things that you learned in this process).
- There is no right or wrong answer or story. Anything you say is ok.
- Assure the sibling that everything they say will be treated confidentially.

See also notes to interviewer at the end.

Beginning:

1. Draw a line drawing of the typical sibling and write the words "once upon a time there was a girl/boy named 'child's name'?" on the left side of the paper. Then, ask the child to tell you about him/herself. Use the following questions to guide you….
    a. Example Questions:
    b. How old are you
    c. When is your birthday
    d. What grade are you in school
    e. What is your favorite color
    f. What is your favorite holiday
    g. What is your favorite subject in school
    h. What do you like to do in your free time
    i. Who are your friends
    j. What do you like best about yourself and why
    k. What do you like least about yourself and why
    l. If you could do anything or be anything, what would you do or be
    m. What would you like people to know about you

2. As the sibling talks, jot down key words and phrases as a list under his/her name on the chart.

3. Then, draw a line drawing of the sibling with a disability writing the words, "once upon a time there was a girl/boy named 'child's name'?" on the right side of the paper. Then, ask the child to tell you about his/her brother/sister. Use the following questions to guide you
    Example Questions:
    a. How old is your brother/sister
    b. When is his/her birthday
    c. What grade is he/she in at school
    d. What is his/her favorite color
    e. What is his/her favorite holiday
    f. What is his/her favorite subject in school
    g. What does he/she like to do in his/her free time
    h. Who are his/her friends
    i. What does your brother/sister do well?
    j. What do you like best about your brother/sister and why
    k. What does he/she have a harder time doing
    l. What do you like least about your brother/sister and why
    m. Is there anything you wish you could change about your brother/sister
    n. If he/she could do anything or be anything, what would you want him/her to be able to do or become
    o. What would you like people to know about your brother/sister

4. As the sibling talks, jot down key words and phrases as a list under the sibling with a disability's name on the chart.

5. Next, draw a line drawing of the sibling with a disability and the typical sibling in the top middle of the paper writing the words "special siblings"

6. Draw two big circles under the pictures

    a. Label the first circle "being a special sibling"
    b. Label the second circle "spending time together"

7. Start with the "being a special sibling" circle, divide the circle into four parts like a pie chart and label each piece as follows
    a. "Good" – ask the sibling what is good/fun about being a special sibling and having a brother or sister with a disability
    b. "Bad" – ask the sibling what is bad/hard about being a special sibling and having a brother or sister with a disability
    c. "Help" – ask the sibling what would make having a special sibling better or easier
    d. "Dream" – ask the sibling what his/her special dream is for the sibling dyad

8. Now, move to the "spending time together" circle, divide the circle into five parts like a pie chart and label each piece as follows
    a. "How much" – ask the sibling how much time he/she spends with his/her brother/sister
    b. "What" – ask the sibling what kinds of activities he/she does with his/her brother/sister (i.e. recreation, family routines, education)
    c. "Good" – ask the sibling what is good/fun about spending time with his/her brother/sister
    d. "Bad" – ask the sibling what is bad/hard about spending time with his/her brother/sister
    e. "Help" – ask the sibling what would make spending time together better or easier

9. Throughout the process of constructing the story, reflect back to the sibling her strengths and affirm her struggles and frustrations.

<u>Conclusion:</u>

1. Near the end of the story, talk about how the intervention might make being a special sibling and spending time with a child with a disability easier and more fun; relate this back to the details the sib gave
2. Retell the story to the sibling in brief form, emphasizing the strengths and individuality of both the typical sibling and the sibling with a disability
3. Encourage the sibling to tell her story with her family. Give her the chart to keep.
4. Thank the sibling for sharing her story with us.

<u>Notes to Interviewers:</u>

1. Be a mirror for the sibling. Do not judge him/her. Do reflect back to her courage and strength. Acknowledge the pain and frustrations.
2. Be willing to share (when appropriate) from your own life in ways that affirm the sibling's story.
3. Be real. This is not a time to retreat emotionally from the sibling. Be as authentic as you can be.
4. Listen deeply. Try to hear what the sibling is telling you. Listen for the said and the unsaid.
5. Listen for and look for the hopes for the future for the typical sibling and the sibling with a disability. When you can honestly address those hopes, do so (e.g., let's think of some ways we can encourage an interest in books and words).
6. Do not deny the hard stuff. Affirm the sibling's right to feel sad.

APPENDIX E

RESPONSIVE INTERACTION TRAINING MANUAL

Sibling Responsive Interaction
Training Manual
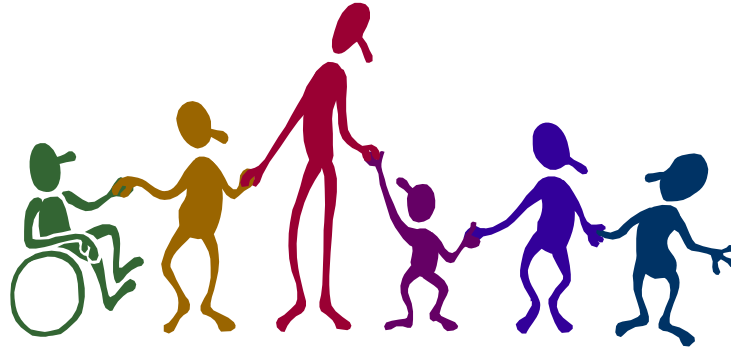
You can make play time with your brother more fun by learning

***how to be <u>responsive</u> during your interactions with him.***

- To be <u>responsive</u> to your brother, try to do these things:
  - <u>WATCH</u> and <u>LISTEN</u>
  - <u>JOIN</u> in your brother's play
  - <u>MIRROR</u> your brother's actions
  - <u>RESPOND</u> to everything your brother says with sounds and/or words by
    - <u>Using comments NOT questions</u>
    - <u>Repeating</u>
    - <u>Describing</u>
  - <u>Then, WAIT</u> and give your brother a chance to respond to you.
  - <u>RESPOND</u> to everything your brother says with gestures by
    - <u>Using comments NOT questions</u>
    - <u>Repeating</u>
    - <u>Describing</u>
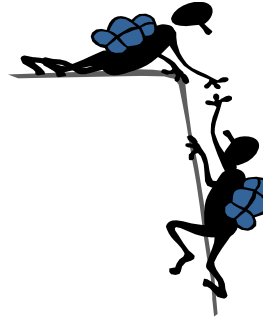
Watch and Listen

- Watch your brother while he is playing.
  - What is he doing?
  - What does he like to play with?
- Listen to your brother while he is playing.
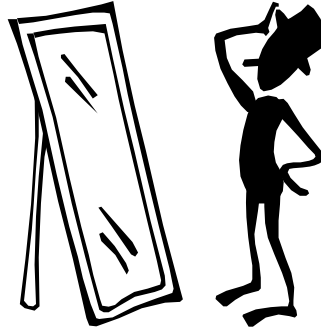 - What is he saying?
  - What is he trying to say?
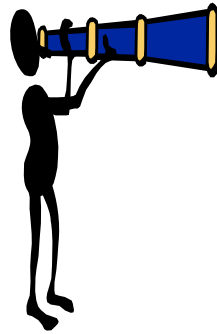
Join

- Join in your brother's play.
  - Play with the toys that he is playing with.
  - Join in the activity that your brother is participating in.

Mirror
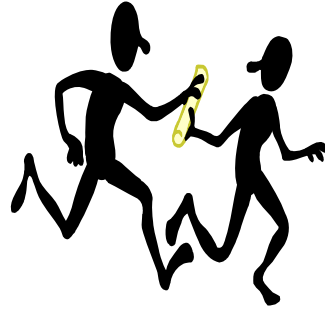
- Be a mirror image of your brother.

Mirror

- Imitate your brother's actions.

- Do what he does with the toys that your are playing with.

Take Turns

- Take turns playing and talking.

- Take turns by…
  - Mirroring
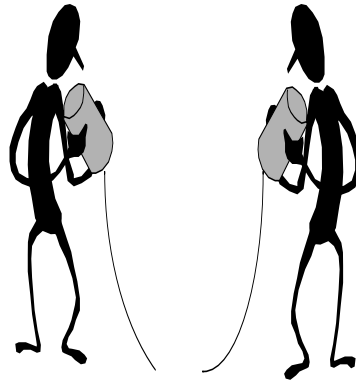 - Responding
  - Waiting

Respond to Sounds and Words

- Respond to EVERYTHING that your brother says.

- You can respond when you DO understand what he is saying

AND

  You can respond when you DON'T understand what he is saying.

Wait

- After you respond, wait and listen for your brother to take another turn.

- Waiting gives your brother a chance to talk.

- Give you brother at least 5 seconds to talk to you.

- Then, you can take another turn.

No Questions

- Use comments to talk to your brother.

- Try not to ask questions.

- When you ask your brother a question, he doesn't get a chance to say very much back to you.
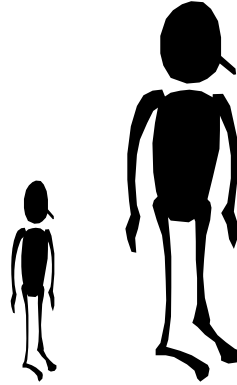
Respond: Repeat and Wait

- Respond to everything that your brother says by repeating him.

- Repeat real words if you understand what your brother is saying.

- Repeat the sounds that your brother makes if you can't understand what he is saying.

- Don't forget to WAIT after your REPEAT.

    – Brother says, "ball"
    – You say, "ball"

    – Brother says, "blah, blah, blah"
    – You say, "blah, blah, blah"

Respond: Expand and Wait

- If you can understand what your brother is saying, you can expand it.

- Expand by REPEATING what your brother says and ADDING on to it.

- Don't forget to WAIT after you EXPAND.

  - Brother says, "Ball"
  - You say, "Big ball" or "you have a ball".

Respond: Describe and Wait

- If you can't understand what your brother says,

OR

    If you don't want to repeat what he says,

You can DESCRIBE something about the activity that the two of you are doing.
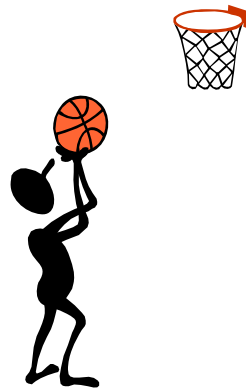
Example: "We are playing football."

Respond: Describe and Wait

- You can describe
  what YOU are doing
  or what your
  BROTHER is doing.

- Don't forget to WAIT
  after you DESCRIBE.

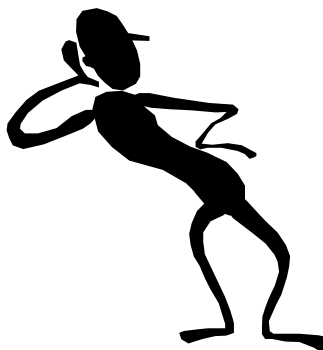Example: "I am playing
  basketball."

Respond to Gestures

- Respond to your brother when he uses gestures to talk to you

- Respond to your brother when he…
  - Shows you something
  - Points to something
  - Gives you something
  - Or uses sign language to tell you something

Wait

- After you respond, wait;

- Listen and watch for your brother to take another turn.

- Waiting gives your brother a chance to do or say something.

- Give you brother at least 5 seconds to communicate with you.
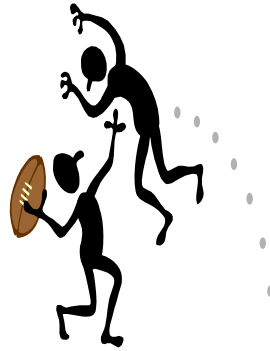
- Then, you can take another turn.

Respond: Describe and Wait

You can respond to your brother's gestures by describing and waiting

You can DESCRIBE something about the activity that the two of you are doing.
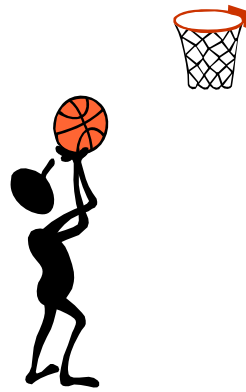
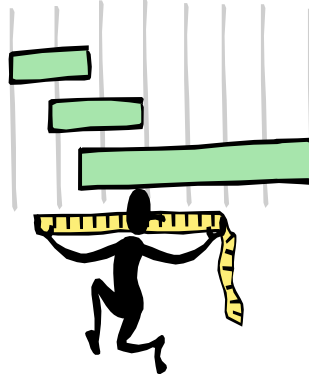Example: "We are playing football."

Respond: Describe and Wait

- You can describe what YOU are doing or what your BROTHER is doing.

- Don't forget to WAIT after you DESCRIBE.

Example: "I am playing basketball."

Keep it Simple

- Try not to use really long sentences and phrases to talk to your brother.

- Use short sentences and simple words to talk to your brother.

Take Turns Everywhere

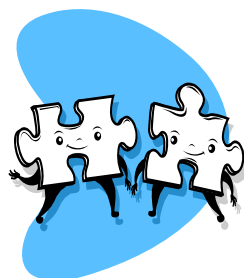- Take turns talking in lots of different activities

- Take turns doing things during lots of different activities

Sharing the Activity: Playing with Toys

Share materials and take-turns participating in the activity (i.e., putting pieces in a puzzle)

Sharing the Activity: Chores

Share materials and take-turns participating in the activity (i.e., putting a dish in the dishwasher)

Assign roles for participating in the activity (i.e., the sib with Down syndrome is assigned the role of handing dishes to the typical sib and the typical sib is assigned the role of putting the dishes in the dish washer)

Sharing the Activity: Making Something

Share materials and take-turns participating in the activity (i.e., putting peanut butter on a cracker)

Assign roles for participating in the activity (i.e., the sib with Down syndrome is assigned the role of handing spoons of peanut butter to the typical sib and the typical sib is assigned the role of spreading the peanut butter on the cracker)

Congratulations!!!
You Are a Responsive Superstar!!!

- By doing these things:

    - <u>WATCH</u> and <u>LISTEN</u>
    - <u>JOIN</u> in your brother's play
    - <u>MIRROR</u> your brother's actions
    - <u>RESPOND</u> to everything your brother says by
        - <u>Using comments NOT questions</u>
        - <u>Repeating</u>
        - <u>Describing</u>
    - <u>Then, WAIT</u> and give your brother a chance to respond to you.
    - <u>RESPOND</u> to everything your brother says with gestures by
        - <u>Using comments NOT questions</u>
        - <u>Repeating</u>
        - <u>Describing</u>

- You have the power to make playing with your brother more fun for both of you.

APPENDIX F

SIBLING SELF-EVALUATION FORM

Sibling Self-Evaluation Worksheet

Name:_____   Date:_____

1) Did you respond to your brother/sister when he/she communicated with you?
   Yes_____ How? (Give an example)

   No_____What could you do differently?

2) Did you take turns playing or participating in the activity with your brother/sister?
   Yes_____ How? (Give an example)

   No_____What could you do differently?

3) Did you take turns talking with your brother/sister?
   Yes_____ How? (Give an example)

   No_____What could you do differently?

Interventionist Signature: Date:
_____
Comments:
_____
_____
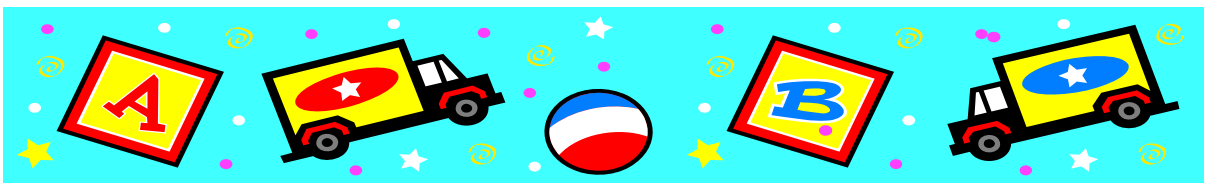
APPENDIX G

SIBLING WORKSHEETS

How I play with my brother

Activity_____

How can I share the toys?_____

_____

_____

How can I take turns playing with my
brother?_____

_____

_____

What can I talk about with my brother?_____

_____

_____

How I work with my brother

Activity_____

How can I share with my brother?_____

_____

_____

How can I take turns working with my
brother?_____

_____

_____

What can I talk about with my brother? _____

_____

_____

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