

REGULAR ARTICLE

Older Siblings' Use of Responsive Interaction Strategies and Effects on Their Younger Siblings with Down Syndrome

**ALACIA TRENT-STAINBROOK, ANN P. KAISER AND
JENNIFER R. FREY**

Vanderbilt University

The effects of an intervention designed to facilitate interactions between older typically developing siblings and their younger siblings with Down syndrome were investigated. Older siblings were taught to use two responsive interaction strategies through the use of written materials, modeling, role play, and oral feedback. Following training, older siblings increased their use of mirroring and verbal responding. Intentional communicative behaviors increased among their younger siblings. One-month follow-up observations indicated that older siblings maintained their use of the responsive interaction strategies, but the effects of the intervention did not appear to generalize to an untrained setting. In an assessment of social validity, blind observers found sibling interactions to appear more positive and reciprocal following intervention than during baseline.

Social interaction skills are prerequisite for communicating with others. While typically developing children have many opportunities for learning and using social skills in their daily lives, children with developmental delays might be unable to engage in such learning opportunities due to their less developed social skills (Girolametto, 1988). Social and communication skills in young children with disabilities might be facilitated by increasing opportunities for these children to participate in social interactions and by improving the quality of naturally occurring interactions. Responsive interaction strategies, for example, are effective for promoting social interactions and engagement between young children with developmental delays and their interaction partners (Weiss, 1981; Girolametto, 1988). Teaching parents to use responsive interaction strategies encourages

them to become more responsive and less dominant and directive during interactions with their children. Studies examining the effects of training parents consistently report that mothers are capable of learning to use responsive interaction strategies and that their use of these strategies promotes the language and social development of their young children with developmental delays and disabilities (Girolametto, 1988; Kaiser et al., 1996).

Siblings have also been taught to implement responsive interaction strategies with their younger siblings with Down syndrome (Trent, Kaiser, & Wolery, 2005). In that study, the effects of an intervention designed to facilitate interactions between two older typically developing siblings and their younger siblings with Down syndrome were investigated using a multiple baseline design

across behaviors. Following intervention, older siblings demonstrated the ability to use the responsive interaction strategies during play and modest changes were observed in the communicative behaviors of their siblings with Down syndrome.

The primary purpose of this study was to replicate the study by Trent et al. (2005) on teaching older, typically developing siblings two responsive interaction strategies (mirroring and verbal responding) in the context of play sessions with their younger siblings with Down syndrome. The second purpose was to investigate the effects of the sibling-implemented responsive interaction intervention on the intentional communicative behavior of the children with Down syndrome. Trent and colleagues investigated only the effects of the intervention on the verbal behaviors of the children with Down syndrome. Because many children with disabilities often communicate with nonverbal forms of language, the current study included verbal and nonverbal intentional communication measures of child communication. Finally, a third purpose for conducting this study was to extend the study by Trent et al. (2005) by evaluating the effects of the intervention on both the older siblings and those with Down syndrome in an untrained, generalization setting (i.e., preparing a snack). As most siblings do not spend all of their time playing together, it was important to determine whether the effects of the intervention generalized to other settings.

The responsive interaction intervention used in this study was adapted from the procedures used in previous studies (Kaiser & Delaney, 1998; Kaiser, Hancock, & Hester, 1998). The two features of responsive interaction, nonverbal mirroring and verbal responding, were selected for intervention as they appeared to be foundational approaches for promoting reciprocal interactions. Mirroring, defined as the contingent imitation of nonverbal behavior, requires the older sibling to attend to the nonverbal behaviors of the sibling with a disability. The older siblings might be more likely to make activity-relevant comments and contingent responses

when their attention is focused on the actions of the sibling with a disability than when their attention is focused primarily on their own actions and play agendas. Verbal responding was defined as contingent verbal responsiveness and verbal commenting following a pause in turn-taking. Contingent verbal responding balances sibling turns and allows the child with a disability a number of opportunities to initiate and respond.

METHOD

Participants

The participants in this study were three sibling dyads, each including a younger sibling (hereafter referred to as younger sibling) and an older typically developing sibling (hereafter referred to as older sibling). Demographic data on the older siblings and their younger siblings are shown in Table 1. All sibling dyads met the prespecified criteria for inclusion in the study. To be included, older siblings had to be between 6 and 12 years of age, willing to participate in the study and sign an assent form. Younger siblings were required to be between the ages of 5 and 11 years and have significant language delays. Mothers of each sibling dyad provided written consent for their own and their children's participation in the study.

Significant language delays of younger siblings were documented by scores from the Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 1997), Expressive Vocabulary Test (EVT; Williams, 1997), Preschool Language Scale (PLS-3; Zimmerman, Steiner, & Pond, 1992), and the Leiter International Performance Scale - Revised (Leiter-R; Roid & Miller, 1997). These assessment measures provided information about the child's receptive language skills, expressive language skills, auditory and expressive communication skills, and nonverbal intellectual ability. Additionally, younger siblings' mean length of utterances (MLU) and diversity of vocabulary were calculated from a 20-min language sample. Younger siblings' scores on the

Table 1
Characteristics of Older Siblings and Younger Siblings at Baseline

| Characteristic | Older sibling 1 | Younger sibling 1 | Older sibling 2 | Younger sibling 2 | Older sibling 3 | Younger sibling 3 |
|----------------|-----------------|-------------------|-----------------|-------------------|---------------------|---------------------|
| Age (years) | 10 | 6 | 9 | 8 | 9 | 5 |
| Academic grade | 5 | Kindergarten | 3 | 1 | Home-school program | Home-school program |
| Gender | Female | Female | Male | Male | Female | Female |
| Leiter-R | - | 75 | - | 38 | - | -* |
| EVT | - | 77 | - | 40 | - | -* |
| PPVT | - | 53 | - | 40 | - | 75 |
| PLS-3 | - | 50 | - | 50 | - | -* |
| MLU | - | 1.57 | - | 1.00 | - | 2.68 |
| Diversity | - | 91 | - | 2 | - | 148 |

Note. Leiter-R = Leiter International Performance Scale - Revised; EVT = Expressive Vocabulary Test; PPVT = Peabody Picture Vocabulary Test; PLS-3 = Preschool Language Scale, Third Edition; MLU = mean length of utterance based on a 20-min language sample; Diversity = diversity of vocabulary based on a 20-min language sample; Scores on EVT, PPVT, and PLS-3 are standard scores. *Leiter, EVT, and PLS-3 scores were not available for Younger Sibling 3.

assessment tools, MLU, and diversity of vocabulary are reported in Table 1.

Trainers

Training sessions were conducted by the first author (Trainer 1) and a research assistant (Trainer 2). Trainer 2 was trained by Trainer 1 to implement the responsive interaction intervention with siblings. Training consisted of weekly meetings that included discussion, coaching, and feedback plus observations of Trainer 1 working with other sibling dyads.

Setting and Materials

All observation and training sessions occurred in the homes of the participants. Observations were videotaped with a digital camera. Each session lasted 30 to 60 min and consisted of the trainer training and providing feedback to the older sibling followed by a 10-min play segment; the 10-min play segment was videotaped for data collection. Most sessions were conducted in the families' living room area. Televisions and radios were turned off and the children were asked to remain in the room they had selected during experimental sessions. Generalization sessions lasted 10 min and were held during a snack time in the families' kitchens. Parents and other siblings were permitted to watch

intervention sessions but were asked to remain quiet throughout the session.

During training sessions, children in all dyads played with toys provided by the trainer. The older siblings chose the toys for each session from a list of choices provided by the trainer. Toys and activities for the play sessions met the following criteria: (a) allowed for two participants to play; (b) were noncompetitive in nature (e.g., no board games, video games, or card games); (c) could be used in the designated play area; and (d) included at least two of each toy so both siblings could have one. The most frequently selected activities were block play, dress-up, bubbles, play dough, painting, water play, and race cars.

Design and Procedures

We used a multiple baseline design across behaviors (McReynold & Kearns, 1983) replicated across three sibling dyads. The study was divided into four consecutive conditions: (a) baseline, (b) nonverbal mirroring training, (c) verbal responsiveness training, and (d) follow up. Each treatment condition continued until the older sibling's data were higher than baseline levels for at least three consecutive sessions. Generalization probes occurred in baseline, mirroring, and responding conditions.

Baseline. Baseline sessions were conducted twice each week at the children's homes. During baseline observations, siblings were asked to play together for 10 min with the toys provided by the trainer and to stay within the designated play area. No other directions were given. The sessions were similar to training sessions in that the siblings were asked to stay in one room for the entire 10 min with the television and radio off and with parents and other siblings outside of the room.

Intervention. Intervention sessions were conducted twice each week in the home and each lasted 30 to 60 min. Intervention sessions were divided into three segments during both conditions of intervention. The first segment included either the trainer teaching the older sibling one of the responsive interaction strategies or reviewing the previously taught strategies. The younger sibling was 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 trainer with the use of a Responsive Interaction Pictorial Manual developed for this project and available from the first author, (b) opportunity for the older 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. Typically, the teaching part of the sessions lasted about 20 min and was briefer during the latter portions of each intervention condition. The next 10 min involved a play-based interaction between the older sibling and the younger sibling. This interaction was videotaped. While siblings were asked to play together for 10 min, data were collected from the first full 5 min of the tape. The decision to code only 5 min of each session was made to keep data collection feasible and because the first full 5 min were thought to be the most representative of the older siblings' abilities to implement the responsive interaction strategies. Younger siblings often became fatigued or less interested in a single activity toward the end of

a 10-min session making it more difficult for the older sibling to use the responsive interaction strategies. Furthermore, it often was difficult to make generalization sessions last a full 10 min (e.g., making a peanut butter and jelly sandwich does not necessarily require 10 min). To keep generalization session data comparable to treatment session data, the length of the session to be coded was kept at 5 min. After the play interaction, the trainer provided positive and corrective feedback to the older sibling while the older sibling, the younger sibling, and the trainer watched the video of the preceding play interaction. The session concluded with the trainer and older sibling planning activities for the next intervention session.

Older siblings were taught two responsive interaction strategies, nonverbal mirroring, and verbal responding. During mirroring training, older siblings were taught to imitate the appropriate nonverbal behaviors of their younger siblings. To imitate the nonverbal play behaviors of the sibling with Down syndrome, older siblings had to use identical movements to manipulate separate but similar toys as those manipulated by the younger sibling. This contingent imitation could occur with or without an accompanying verbalization. Imitation had to occur simultaneously (e.g., the older sibling and the younger sibling smashed play dough at the same time; the younger sibling pretended to feed a doll and the older sibling pretended to feed a doll too).

For verbal responding, siblings were taught contingent verbal responsiveness and verbal commenting. For contingent verbal responsiveness, the older siblings were taught to respond verbally to both verbal and nonverbal acts of intentional communication performed by the younger siblings. To simplify the intervention for the older siblings, they were taught to respond only following overt acts of intentional communication: (a) verbalizations by the younger sibling directed toward the older sibling, (b) attempts by the younger sibling to show the older sibling something by pointing to an object or event, (c) attempts by the younger

sibling to give the older sibling an object, and (d) attempts by the younger sibling to communicate using sign language. Additional, less overt acts of intentional communication (e.g., smile, reach) by the younger siblings were coded and counted as communication attempts, but the older siblings were not expected to respond to them. Older siblings were taught to respond by (a) verbally repeating any part of what their younger siblings said, or (b) verbally describing the activities in which the two siblings were participating. As part of the responsiveness training, older siblings also were taught to pause for at least 5 s after each of their own verbal turns to allow their younger siblings an opportunity to respond. Correct verbal responding episodes were scored when the older siblings responded to a communicative attempt by their younger siblings and then paused for 5 s.

Older siblings also were taught to use verbal comments. That is, they were taught to take another turn if their younger siblings did not attempt to communicate, either verbally or nonverbally, (a) within the 5 s, or (b) following a verbal or nonverbal turn taken by their younger siblings during the 5-s period. Older siblings were taught to comment by using descriptive statements about something they themselves were doing in the activity, what their younger siblings were doing, or what they were doing together. Correct verbal commenting episodes were scored when, following a 5-s pause, the older sibling made a descriptive comment followed by another 5-s pause.

Throughout the intervention, the trainer was present to provide prompts to the older siblings when necessary. Prompts consisted of verbal directives spoken aloud and were limited to two prompts per min for a maximum of 10 prompts per 5-min session. Prompting was used to remind older siblings to mirror and verbally respond and to suggest ways of mirroring and verbally responding. Praise for correct use of the intervention strategies was used throughout all intervention sessions. Praise statements were limited to 2 statements per min for

a maximum of 10 praise statements per 5 min session. Praise described the siblings' appropriate behaviors (e.g., "good job mirroring," "great job responding to everything").

Generalization. Generalization sessions were conducted during approximately every fourth baseline and intervention session. During generalization sessions, siblings were asked to prepare a snack together. Generalization sessions were typically 10 to 15 min in length. Generalization sessions were similar to baseline sessions in that the trainer provided no prompts or praise.

Follow up. A follow-up session was conducted approximately a month after completion of the intervention. These sessions were identical to baseline sessions in which siblings were asked to play together for 10 min with the toys that had been provided. No prompts, directions, or feedback were given during these sessions.

Measures

Three classes of behavior were measured using the sibling interaction code: (a) use of responsive interaction strategies by the older siblings, (b) acts of intentional communication by the younger siblings, and (c) verbal prompts and praise provided by the trainer during training sessions. Specific codes for the acts of intentional communication by the younger siblings were adapted from a code created by Yoder (2003). Observational data were collected on these 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 of the above behaviors except for mirroring. Momentary time sampling with 10-s intervals was used to measure mirroring due to the difficulty in segmenting different acts of mirroring. ProcoderDV was used to code (a) frequencies of responding by the older siblings following a turn by the younger sibling or a 5-s pause, (b) frequencies of acts of intentional communication by the younger siblings, (c) frequencies of training and praise by the trainers, and (d) the percent of intervals during which mirroring took place.

Table 2
Mean Percent of Interobserver Agreement for Each Behavior

| Behavior | Dyad 1 <i>M%</i> | Dyad 2 <i>M%</i> | Dyad 3 <i>M%</i> |
|--------------------------|------------------|------------------|------------------|
| Older sibling mirroring | 93% | 97% | 100% |
| Older sibling responding | 80% | 98% | 92% |
| Younger sibling comments | 88% | 96% | 94% |
| Younger sibling requests | 97% | 100% | 94% |
| Trainer prompts | 100% | 100% | 100% |
| Trainer praise | 100% | 100% | 100% |

Older sibling percentage of responsiveness was calculated by determining the number of times the younger siblings had intentional communications and the number of times the older siblings responded to acts of intentional communication within a 5 s window. The percentage responsiveness was calculated by dividing the sum of older siblings' responses to acts of intentional communication by the sum of acts of intentional communication by the younger siblings and multiplying this quotient by 100.

Intentional communication, the primary measure for the younger siblings, was divided into two pragmatic categories: (a) comments and (b) requests. Acts of intentional communication included acts that required coordinated attention (i.e., nonword vocalizations, reach, clap, smile, contact point, and touch older sibling) and acts that did not require coordinated attention (i.e., referential word or sign, conventional gesture, give, show, extend upturned palm to older sibling, distal point, or a movement of the older sibling's hand to an object). These acts were then labeled as comments or requests, depending on their function. An act of intentional communication was coded as a comment if the apparent intent was to direct the older sibling's attention, share positive affect, or share interest. An act of intentional communication was coded as a request if the apparent intent was to request an action, object, help, comfort, or a label, or to maintain turn-taking or an ongoing routine.

Interobserver Agreement

Interobserver agreement (IOA) data were collected on coding the behaviors of the

older siblings, younger siblings, and trainer prompts. A trained observer watched and coded data from the videos of all experimental sessions for all dyads. IOA was assessed on approximately 25% of the baseline, intervention, and follow-up sessions for each dyad by having a second observer independently code the tapes. 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. For interval coding, ProcoderDV was used to estimate interval-by-interval interobserver agreement. The percentage agreement was calculated for mirroring using the formula number of agreements divided by the number of agreements plus disagreements, with the quotient multiplied by 100. Coders were trained to criterion (85% IOA) prior to the start of the current study. Results of IOA assessments are shown in Table 2. The IOA ranged between 64% and 100% for all behaviors for all dyads across baseline, mirroring training, responding training, and follow-up sessions. Lower rates of IOA often corresponded with lower frequencies of behaviors or the presence of new behaviors that were not yet defined by the code.

The procedural fidelity of each trainer's implementation of the training procedures was assessed during 25% of each dyad's baseline and intervention sessions for a total of 14 assessments. To assess procedural fidelity, the primary observer used a 14-item checklist of the intervention training components (e.g., use of pictorial manual, role play). Percentage fidelity was calculated

using the formula: number of items scored correct divided by the total number of items observed, with the quotient multiplied by 100. Procedural fidelity ranged between 86% and 100% for the three dyads across mirroring training and responding training sessions ($M = 96\%$).

Social Validity

Following the completion of the study, 10 master's level students in special education participated in an assessment of social validity. The students viewed 1-min clips of each dyad in a baseline session and in an intervention session. Clips were taken from the first baseline sessions and the last intervention sessions for each dyad. The 10 students watched the video clips at the same time; thus, each student observed the video clips in the same order. Without knowing which sessions were baseline and which were intervention, the students completed a 12-item questionnaire on the behavior and language of the sibling dyads in each clip. The questionnaire asked students to determine to how much they agreed (i.e., strongly agree, agree, disagree, strongly disagree, or can't tell) the older sibling was using responsive interaction strategies with the younger siblings, the younger siblings were communicating with the older siblings, and the siblings were enjoying spending time together and were interacting positively. Example items included "the target sibling mirrors or imitates the actions of the child with Down syndrome", "the sibling with Down syndrome takes verbal turns (e.g. intelligible comments and unintelligible utterances) during the interaction", and "both siblings are positively interacting with each other".

RESULTS

Older Sibling Behavior

Older sibling behaviors during baseline and training conditions are shown in Figure 1. Means and standard deviations of older sibling use of mirroring and responding across conditions are shown in Table 3.

Data on prompted and spontaneous strategy use are presented, but not separately. After the older siblings received training in the use of mirroring as a responsive interaction strategy, they were able to use mirroring during play sessions. The number of intervals in which mirroring was used was relatively low for the older siblings (TS1, TS2, and TS3) throughout the baseline condition. With the introduction of mirroring training, older sibling 1 showed an immediate increase in level of mirroring use and an accelerating trend. Older sibling 3's use of mirroring remained near baseline levels at the first session of mirroring training but showed a significant increase on the second mirroring training session. The use of mirroring by older sibling 1 and older sibling 3 remained stable and above baseline levels throughout the responding condition. Older sibling 2 showed an increase in level of mirroring use beginning at the second mirroring training session. Use of mirroring by older sibling 2 remained primarily above baseline levels throughout the mirroring and verbal responding training phases; there were only a few data points in the verbal responding phase that overlapped with baseline data.

The numbers of contingent verbal responses and comments were low, with limited variability, for the three dyads during both baseline and mirroring training conditions. With the introduction of responding training, older sibling 1 and older sibling 3 showed an immediate increase in level and an accelerating trend in their use of responding and descriptive commenting. Older sibling 2 showed an increase in level of responding and descriptive commenting following the second responding training session. This change maintained throughout the condition, with limited variability.

Percentage of responsiveness. Percentages of responsiveness were low for older sibling 1, older sibling 2, and older sibling 3 throughout the baseline and mirroring conditions, with some variability in performance across dyads (see Table 3). Following the introduction of responding training, all

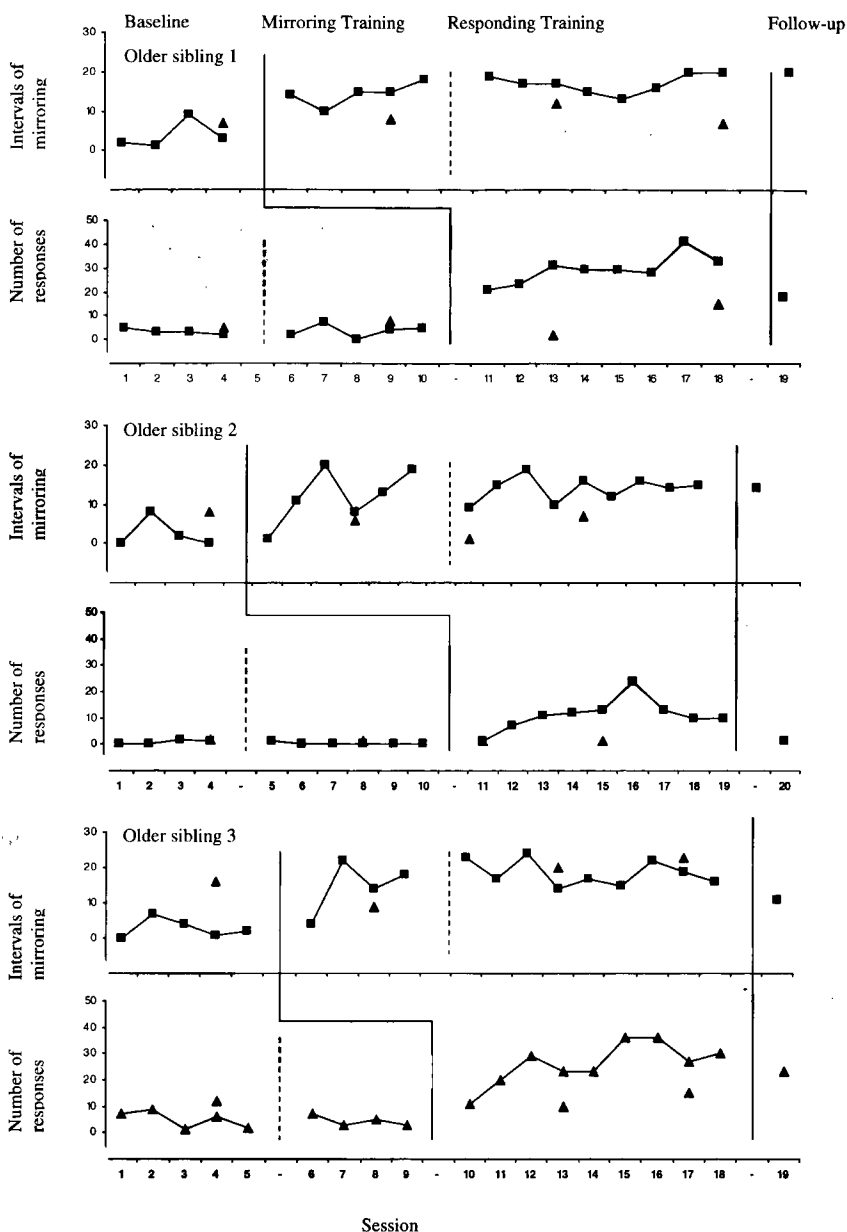


Figure 1.

Number of intervals in which the older siblings used mirroring and the number of verbal responses during baseline, mirroring training, responding training, and follow-up sessions. Triangles indicate data from generalization sessions.

dyads showed an immediate increase in level of responding that maintained above baseline levels throughout the condition. Older sibling 3 also demonstrated an accelerating trend in percentage of responsiveness across the condition.

Behaviors of the Younger Siblings

Effects of older sibling training on their younger siblings were evident but somewhat different for each of the dyads. The behaviors of the younger siblings across baseline and training conditions are shown in Figure 2

Table 3

Intervention Effects for Older siblings and Younger siblings

| Condition | Baseline <i>M(SD)</i> | Mirroring Training <i>M(SD)</i> | Responding Training <i>M(SD)</i> | Baseline Generalization <i>M(SD)</i> | Mirroring Generalization <i>M(SD)</i> | Responding Generalization <i>M(SD)</i> | Follow-up <i>M(SD)</i> |
|-----------------------|--------------------------|---------------------------------------|--|--|---|--|---------------------------|
| Sibling Dyad 1 | | | | | | | |
| Mirroring | 3.8(3.4) | 13.3(3.7) | 15.6(4.1) | 7.0 | 8.0 | 9.5 (3.5) | 20.0 |
| Responding | 3.6(1.3) | 4.5(2.9) | 25.2(10.8) | 5.0 | 8.0 | 8.5 (9.2) | 18.0 |
| % Responsiveness | 14.4(4.9) | 14.7(8.8) | 69.3(27.0) | 19.0 | 21.0 | 23.5 (21.9) | 55.0 |
| Commenting | 22.8(2.3) | 27.5(7.7) | 32.6(9.3) | 25.0 | 37.0 | 31.0 (9.9) | 33.0 |
| Requesting | 2.0(1.6) | 1.7(0.8) | 1.0(1.1) | 1.0 | 1.0 | 0.5 (0.7) | 0 |
| MLU | 1.4(0.3) | - | 1.6(0.2) | - | - | - | - |
| Diversity | 27.7(10.0) | - | 29.0(3.6) | - | - | - | - |
| Prompts | 0 | 1.3(1.2) | 1.2(1.4) | 0 | 0 | 0 | 0 |
| Praise | 0 | 3.0(1.5) | 3.0(2.0) | 0 | 0 | 0 | 0 |
| Sibling Dyad 2 | | | | | | | |
| Mirroring | 3.6(4.1) | 11.1(6.9) | 15.0(3.7) | 8.0 | 7.0 | 6.5 (0.7) | 14.0 |
| Responding | 1.0(1.0) | 0.3(0.5) | 10.2(6.6) | 2.0 | 1.0 | 0.5 (0.7) | 1.0 |
| % Responsiveness | 24.1(43.3) | 0.1(1.2) | 49.1(32.5) | 67.0 | 9.0 | 9.0 (1.4) | 0 |
| Commenting | 5.0(5.2) | 3.0(2.6) | 8.0(6.1) | 3.0 | 10.0 | 9.0 (1.4) | 3.0 |
| Requesting | 0 | 0 | 0.1(0.3) | 0 | 1 | 0.5(0.7) | 0 |
| MLU | 1.3(0.4) | - | 1.5(0.5) | - | - | - | - |
| Diversity | 3.3(3.2) | - | 1.7(0.6) | - | - | - | - |
| Sibling Dyad 2 | | | | | | | |
| Prompts | 0 | 1.4(1.1) | 2.6(1.7) | 0 | 0 | 0 | 0 |
| Praise | 0 | 3.3(2.5) | 2.6(2.2) | 0 | 0 | 0 | 0 |
| Sibling Dyad 3 | | | | | | | |
| Mirroring | 5.0(6.4) | 13.4(7.1) | 19.1(3.5) | 16.0 | 9.0 | 18.5 (6.4) | 11.0 |
| Responding | 6.2(4.2) | 4.6(1.7) | 23.6(9.1) | 12.0 | 5.0 | 12.5 (3.5) | 23.0 |
| % Responsiveness | 19.9(17.7) | 13.8(3.0) | 58.8(18.4) | 52.0 | 14.0 | 41.0 (18.4) | 62.0 |
| Commenting | 30.8(5.6) | 31.6(4.7) | 38.0(5.1) | 23.0 | 30.0 | 31.5 (4.9) | 37.0 |
| Requesting | 5.8(2.2) | 3.6(1.8) | 1.3(1.0) | 4.0 | 6.0 | 0.5 (0.7) | 4.0 |
| MLU | 3.5(0.9) | - | 3.0(0.3) | - | - | - | - |
| Diversity | 64.0(11.5) | - | 44.7(1.2) | - | - | - | - |
| Prompts | 0 | 1.4(1.1) | 2.6(1.7) | 0 | 0 | 0 | 0 |
| Praise | 0 | 2.8(1.6) | 1.8(1.3) | 0 | 0 | 0 | 0 |

and Table 3. The frequencies of commenting were high for younger sibling 1 and younger sibling 3 throughout the baseline and mirroring conditions. With the introduction of the responding condition, commenting initially remained stable for younger sibling 1 and increased in level toward the end of intervention. Younger sibling 3 also showed a slight increase in level of commenting during the responding condition. Commenting remained relatively low for younger sibling 2 throughout baseline and mirroring. Following the introduction of the responding condition, younger sibling 2 showed an increase in level of commenting, with some overlapping data points. Requesting remained relatively low for all three younger siblings throughout the study.

Follow Up

Data from a 1-month follow-up observation indicated that older siblings were able to maintain use of the responsive interaction strategies during that period (see Figure 1 and Table 3). The number of intervals during which mirroring was used by older siblings in the follow-up sessions was above baseline levels and similar to the levels observed during intervention. The number of times that the older siblings described or repeated remained high for older sibling 1 and older sibling 3, but decreased for older sibling 2. Percentage responsiveness also remained high for older sibling 1 and older sibling 3. It decreased to 0% for older sibling 2, but given the low rate of commenting and requesting by younger sibling 2, older sibling 2 did not have many opportunities to respond. For younger sibling 2 and younger sibling 3, rates of commenting in follow up show overlap with rates of commenting in baseline. Younger sibling 1's rate of commenting remained above baseline levels at the follow up but decreased in comparison to rates of commenting at the end of the responding training phase (see Figure 2).

Generalization

Generalization data are shown in Table 3. The effects of the intervention do not appear

to have generalized to the snack setting. Older siblings' use of the responsive interaction strategies remained near baseline levels during generalization sessions at all conditions of the intervention. The behaviors of the younger siblings during generalization sessions were variable and near baseline levels as well.

Trainer Prompts and Praise

Although the data on siblings' uses of the responsive interaction strategies include both prompted and spontaneous uses, data on trainer prompts suggested the trainers used few prompts and praise statements to support siblings throughout the intervention. The trainers did not prompt during baseline, generalization, or follow-up sessions; prompts and praise were used by the trainer only in intervention sessions.

Social Validity

In an assessment of social validity following the completion of the study, 10 master's level students rated video clips of the sibling dyads in intervention as more positive and reciprocal than baseline video clips. Scores on the social validity assessment could range from a minimum score of 0 to a maximum score of 48. The mean ratings of baseline video clips were 24.4, 27.9, and 34.2 for Dyad 1, Dyad 2, and Dyad 3, respectively. Mean ratings of intervention clips were 46.8, 33.0, and 44.6 for Dyad 1, Dyad 2, and Dyad 3, respectively. In addition to the social validity assessment, informal interviews with the mothers' of the siblings and the older siblings suggest that the mothers and the older siblings enjoyed participating in the study and found it to be a useful learning experience.

DISCUSSION

All older siblings learned the responsive interaction techniques quickly and used them in interactions with their younger siblings during intervention. The measures of the communicative performance of the children

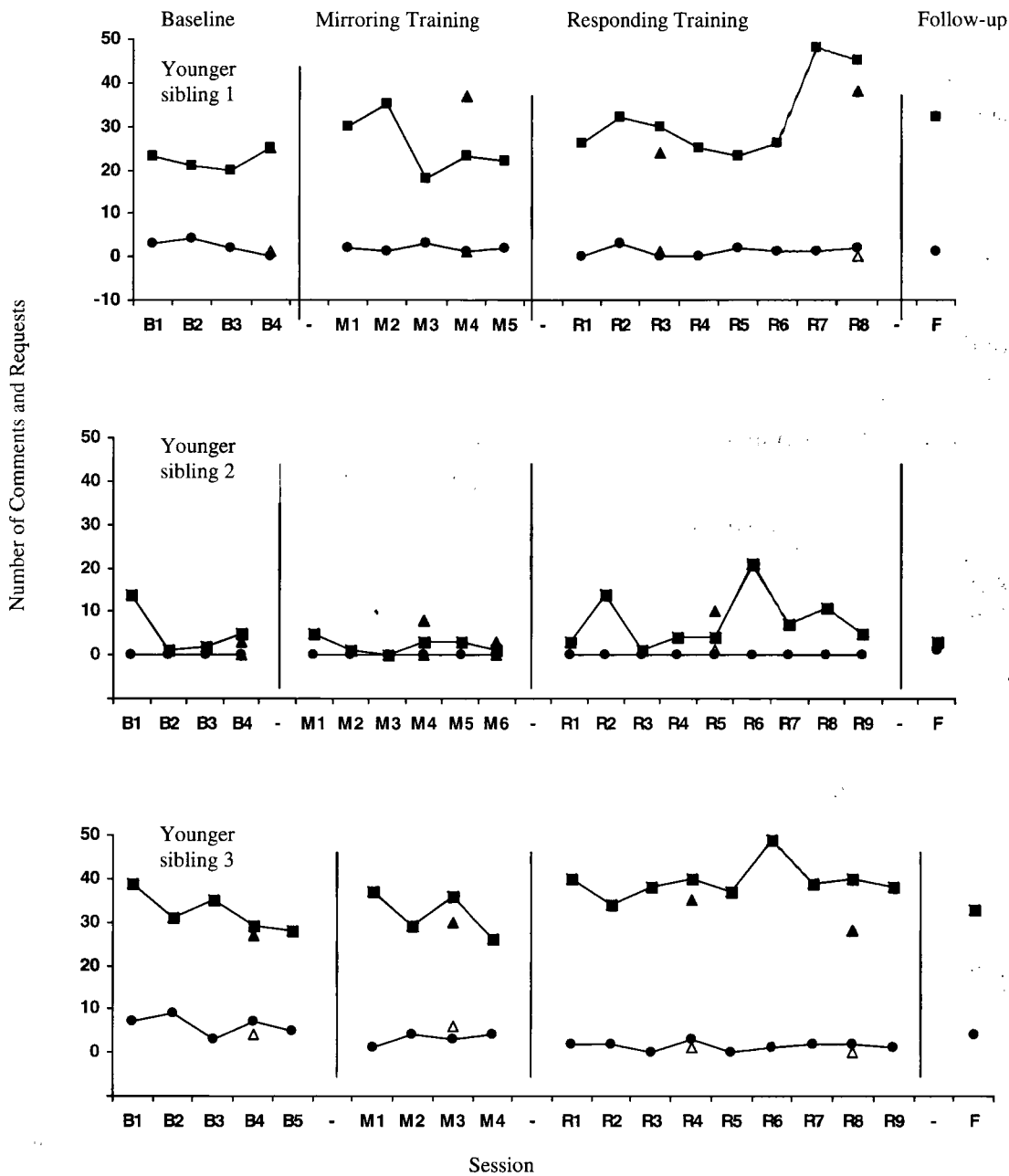


Figure 2. Number of comments and requests made by the younger siblings during baseline, mirroring training, responding training, and follow-up sessions. Squares indicate comments and circles indicate requests. Closed triangles indicate comments and the open triangles indicate requests during generalization sessions.

with Down syndrome revealed a slight increase in the number of comments made in each session. The increase in commenting, evident following implementation of the

intervention, is encouraging given that the frequency of commenting increased without direct prompting. While all younger siblings' commenting increased, younger sibling 2 had

much lower levels of commenting when compared to younger sibling 1 and younger sibling 3. Compared to the other younger siblings, younger sibling 2 had lower receptive and expressive language scores as measured by the PPVT and EVT at baseline (see Table 1). The differing characteristics of the younger siblings might have influenced the response to intervention, as well as the number of intervention sessions necessary to increase commenting. The sibling dyads were only in intervention for 12 to 15 sessions. Of these 12 to 15 sessions, only 8 to 10 sessions took place in the responding training condition of intervention in which younger siblings were likely to be hearing richer, more responsive language from their older siblings. A longer intervention or an extended responding training condition might have shown even stronger effects for the younger siblings, especially for younger sibling 2 who had lower rates of commenting as well as lower scores on language measures.

No change occurred in the number of requests made by the younger siblings. Requesting, however, was not typical in this intervention. The younger siblings were not prompted to request nor were requests modeled by the older siblings. The responsiveness of the older siblings might have actually suppressed rates of requesting. Given the increased responsiveness to communicative attempts made by the younger siblings, there might have been limited need or opportunity for requesting to occur.

Generally, changes in the older siblings' use of responsive interaction strategies and the verbal behaviors of the younger siblings were maintained at the 1-month follow up for all dyads. The rate of repeating and describing and the percentage responsiveness decreased for older sibling 2. Given the low rate of commenting and requesting by younger sibling 2, however, older sibling 2 had limited opportunities to respond. Younger sibling 2 had a low level of play skills; he often performed few actions with the toys provided. Thus, older sibling 2 also was limited on the number of things he could describe regarding his sibling's play.

This intervention might be better suited for children with higher level play skills. Still, the maintenance of change in behaviors for both the older siblings and those with Down syndrome is encouraging. Maintenance data for the current study further supported previous research that has suggested siblings can learn and continue to use intervention strategies over time (Celiberti & Harris, 1993; Hancock & Kaiser, 1996; James & Egel, 1986; Tekin & Kircaali-Iftar, 2002).

The effects of the intervention in the play setting did not readily generalize to the snack setting. Sibling interactions during generalization sessions were positive, but the siblings took very asymmetrical roles. The younger siblings often needed assistance preparing their own snacks. The older siblings often assumed the role of a teacher or helper, instructing the younger siblings on how to prepare the snack rather than being responsive to their acts of intentional communication. Such behavior is not completely unexpected given that the older siblings are likely to be accustomed to assisting their brothers/sisters with Down syndrome when they have difficulty completing a task by themselves. It is possible that generalization of the responsive interaction skills could have been facilitated by a simple reminder from the trainer to use the responsive interaction strategies or by actually training the siblings within generalization settings. It might be unreasonable to assume that a young child should be able to generalize a newly acquired skill to an untrained setting without some assistance.

Generalization of intervention effects might also have been facilitated by training across settings. Older siblings were trained only in one setting, a play setting. Training siblings across a variety of settings and situations in which sibling dyads often spend time together (e.g., meal time, car rides), might have facilitated the ability of the siblings to generalize their use of the responsive interaction strategies. Additionally, older siblings' use of responsive interaction strategies across a variety of settings might

have increased the effects of the intervention on the younger siblings.

Another strategy that might have facilitated older siblings' generalization and maintenance of intervention effects would have been a practice and self-management system. The trainers visited older siblings twice each week. It is not known how often they practiced using the strategies between trainer visits. To promote practice in the future, siblings could be given a calendar on which to indicate which days they practice using the strategies during interactions with their younger brothers/sisters or they could be asked to keep a daily journal of interaction experiences. Siblings could be positively reinforced with a preferred prize after practicing a specified number of times.

In addition to the improvements in behaviors by the older siblings and the younger siblings, the quality of interactions between siblings appeared to improve from baseline to intervention. Assessments of social validity indicated that outside observers found improvements in sibling interactions in intervention. Mean ratings on intervention clips were higher than baseline video clips, demonstrating the observers' view of sibling dyad interactions as more positive and reciprocal in intervention.

Implications

Several implications for practice can be derived from the present study findings. Teaching older siblings strategies to facilitate interactions with their brothers or sisters with disabilities is likely to improve the quality of the time that siblings spend together. 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.

Results of the research on siblings' use of responsive interaction strategies leave questions for future researchers to investigate. First, little is known about the affect of the intervention on the sibling with a disability. Communication skills were assessed in this study and the previous RI study, 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.

Finally, more maintenance data are needed to determine whether typical siblings can continue using responsive interaction strategies without support from the interventionist. In this study and our previous study, siblings demonstrated the ability to use responsive interaction strategies at 1-month follow-up assessments. Future research might consider assessing maintenance at a later interval (i.e. 3 months, 6 months) and having someone other than the interventionist conduct follow-up assessments. The presence of the interventionist might serve as a discriminative stimulus for the typical siblings. If siblings are expected to use the responsive interaction 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.

In conclusion, when older siblings know how to interact with their younger siblings with disabilities, they are more likely to enjoy such interactions. Furthermore, children with Down syndrome are likely to benefit from increased interactions with their older, typically developing brothers and sisters. Interactions between children with disabilities and typically developing children likely provide increased opportunities for the indirect teaching of communicative behaviors.

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Correspondence concerning this article should be addressed to Alacia Trent-Stainbrook, Department of Special Education, Vanderbilt University, Nashville, TN 37203. E-mail: alacia.trent@vanderbilt.edu