**A DIRECT PROMPTING STRATEGY FOR INCREASING
RECIPROCAL INTERACTIONS BETWEEN HANDICAPPED
AND NONHANDICAPPED SIBLINGS**

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We investigated the effects of a sibling training procedure, consisting of direct prompting and modeling, on the occurrence of reciprocal interactions between nonhandicapped and handicapped siblings. Data were obtained for training, generalization, and follow-up. Results of a multiple-baseline design across three pairs of siblings showed that: (a) direct prompting of interactions was an effective strategy for increasing reciprocal interactions between handicapped and nonhandicapped siblings; (b) the training procedure resulted in increased levels of initiations and responsiveness to initiations; (c) reciprocal interactions between siblings generalized to larger play groups or across settings; (d) reciprocal interactions between handicapped subjects and untrained, nonhandicapped peers increased without direct training; (e) the siblings' levels of interactions were maintained at 6 mo follow-up; and (f) these findings were judged socially valid by the siblings' parents.

DESCRIPTORS: siblings, handicapped/nonhandicapped siblings, social behavior, generalization

The importance of social interaction in child development has been well documented (e.g., Guralnick, 1976; Strain, Cooke, & Apolloni, 1976; Van Hasselt, Hersen, Whitehall, & Bellack, 1979). It is therefore not surprising that handicapped children with social skill deficits have been the focus of numerous studies designed to teach social interaction skills. (See Strain, Kerr, & Ragland, 1981, for a review.)

Most investigations designed to increase social interactions between handicapped and nonhandicapped children have been conducted in school settings with handicapped and nonhandicapped peers serving as subjects. A potential, virtually unused resource for training handicapped children to engage in social interaction is the handicapped child's nonhandicapped sibling. Several authors

have noted the critical role siblings play in the development of social skills (e.g., Abramovitch, Pepler, & Corter, 1982; Dunn, 1983; Powell & Ogle, 1985). Hartup (1978) suggested that siblings provide a foundation for the child's initial exploration of his/her social environment and later social development. Additionally, Abramovitch, Corter, and Lando (1979) concluded that siblings may be the major source of social interaction during the first few years of life.

While interactions frequently occur between nonhandicapped siblings, there is some question as to whether high levels of interaction occur when one of the siblings is handicapped (e.g., Mash & Mercer, 1979). Powell and Ogle (1985) noted that the lack of interaction between handicapped and nonhandicapped siblings may be especially detrimental because the handicapped child's disability may decrease the opportunity for interactions with nonhandicapped peers in other settings.

Despite the importance of facilitating reciprocal social interactions between handicapped and nonhandicapped siblings, few empirical investigations have been conducted, and most of these studies were designed to teach a nonhandicapped sibling how to implement task-specific behavior modification procedures with the handicapped sibling

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(e.g., Cash & Evans, 1975; Colleti & Harris, 1977; Miller & Cantwell, 1976; Schreibman, O'Neill, & Koegel, 1983). Powell, Salzberg, Rule, Levy, and Itzkowitz (1983) conducted the only other study that evaluated empirically a program designed to increase reciprocal interactions between handicapped and nonhandicapped siblings. In this study, parents participated in a training program that emphasized skills such as identification of appropriate interactions, reinforcement, prompting, and selection of toys and activities likely to promote reciprocal interactions. The results demonstrated that the parents acquired the target skills, and as a result, sibling interactions increased above baseline levels. Furthermore, the increase in interactions was sustained in the absence of the parents.

The present study was designed to evaluate a direct prompting training strategy for increasing reciprocal interactions between siblings. Direct prompting was selected because recent research has demonstrated that, in some cases, it may be more effective than other procedures (e.g., role playing) used to teach social interaction skills (Dy, Strain, Fullerton, & Stowitschek, 1981). We also sought to evaluate whether the program would differentially affect initiations of and responses to social interactions. Finally, we were interested in assessing generalization of interaction skills from dyadic (sibling-sibling) to triadic (sibling-sibling-peer) play groups (Sibling Pairs 1 and 2) or across settings (Sibling Pair 3).

METHOD

Subjects

Handicapped siblings. Two girls and one boy who were enrolled in a noncategorical, early childhood special education program participated in this study. They were selected on the basis of observational reports from parents and teachers, substantiated by informal observations, indicating that these children rarely interacted with their siblings or peers. In addition, the children were selected because they displayed toy play and imitative behaviors, and followed simple one-step commands.

Handicapped Sibling 1 was 4 years 6 months

old and had cerebral palsy. He was ambulatory and occasionally spoke in full sentences; however, most of his communications consisted of gesturing and single-word object labeling. Handicapped Sibling 1 obtained a score of 38 on the Stanford-Binet (Form L-M).

Handicapped Sibling 2 was 4 years 2 months old and was diagnosed as mentally retarded (IQ = 32 on Stanford-Binet). She exhibited a variety of stereotypic behaviors (body rocking, head shaking, and mouthing of objects), and her language consisted primarily of one-word utterances (e.g., "hi," "bye," "Mommy").

Handicapped Sibling 3 was 4 years 4 months old and, as a result of cerebral palsy, was confined to an electric wheelchair. She spontaneously used up to 15 signs and constructed sentences consisting of subjects, verbs, and objects. However, her major form of communication was composed of pointing to single pictures on her communication board. She obtained a Stanford-Binet (Form L-M) score of 36.

Classroom curricula for the handicapped siblings focused on cognitive and language development. Specific activities in cognitive development were object permanence, spatial relationships, development of means-ends, causality, and imitation. Activities for language development included labeling (vocally or signing) objects, colors, or prepositions upon request and/or spontaneously, using two-word (or combining two signs) sentences, and following one- and two-step commands.

Nonhandicapped siblings. One older nonhandicapped sibling of each of the target children participated in the study. The siblings (two girls and one boy) ranged in age from 6 years 10 months to 8 years 1 month. Parents reported that each nonhandicapped sibling occasionally attempted to play with his/her handicapped brother/sister but that the handicapped siblings rarely initiated or responded to interactions.

Untrained peers. Two nonhandicapped peers who were friends of the siblings in pairs 1 and 2 also participated in this study. The peers were both female and were 7 years 5 months and 7 years 3 months, respectively. These peers were referred by

the target children's parents, who reported that they possessed appropriate social repertoires and had played with their children for approximately 2 months prior to the investigation. The children's mothers reported that minimal social interaction occurred between the peer and handicapped child. These reports were substantiated by informal observations. A peer for the siblings in pair 3 was not available due to the rural location of their home.

Setting

All free-play, training, generalization, and follow-up sessions for Sibling Pairs 1 and 2 were conducted in a 4 m $\times$ 4 m area of their respective homes, where the children usually spent most of their time playing with toys. This area included household furniture such as tables, chairs, couches, and a television. The setting was similar for Sibling Pair 3, with the exception of generalization sessions, which were conducted outside on the porch.

Behavioral Measures

The primary dependent variable was reciprocal interactions, which was defined as one child's positive initiation (either motor-gestural or vocal-verbal) followed by the partner's positive response (either motor-gestural or vocal-verbal) within 3 s. Two general classes of interaction were assessed using a modified version of Tremblay, Strain, Hendrickson, and Shores' (1981) dyadic observation system: motor-gestural (e.g., sharing, assisting, rough-and-tumble play) and vocal-verbal (e.g., play organizer, statements). Both classes of behavior (excluding play organizer and modeling) were further described as positive or negative, and the temporal characteristics of the behaviors were recorded as initiated or responded events. Operational definitions for each of these categories are given in Table 1.

Toy Inventory/Assessment

Prior to the study, an inventory was taken of the toys in each of the siblings' homes. To help achieve equivalence among the families, toys that appeared in all the homes were used for the toy

preference assessment. The purpose of the toy assessment was to select for training toys that were particularly reinforcing to the handicapped sibling. A similar procedure was used successfully by Shaffer, Egel, and Neef (1984). The experimenter brought the handicapped sibling to the play area and instructed the child to go play with the four toys (ball, car, block, doll) that were located on the floor. The experimenter recorded for 10 min the order of toy selection and the duration of play with each toy. The same procedure continued until stable data were obtained indicating which toy had been played with for the longest duration. This toy (car, ball, doll for Sibling Pairs 1–3, respectively) was subsequently used during the training phases.

Sibling Training

Sibling training began for each dyad with the experimenter bringing the handicapped and nonhandicapped siblings to the play area and proceeding through the following two conditions:

1. **Modeling:** While playing with the handicapped sibling and his/her most preferred toy, the experimenter demonstrated how to initiate interactions, prompt responses, and reinforce both initiations and responses produced by the handicapped sibling. For example, the experimenter may have said "Let's play cars" and pushed the car to the handicapped child. If the handicapped child responded, the experimenter provided reinforcement in the form of social praise ("I like playing with you"). If the handicapped child failed to respond to the initiation, "Let's play cars," the experimenter physically guided the handicapped child to push the car. Following each demonstration, the experimenter explained the modeled behavior to the nonhandicapped sibling. At least four different interactions were always modeled.

2. **Practice with Feedback:** Subsequent to the modeling sessions, the experimenter instructed the nonhandicapped sibling to try his/her best to get the handicapped child to play using the previously modeled strategies. For the next 5 min, the experimenter observed the siblings while providing instructional cues and feedback to the nonhandicapped child. For example, following 10 s in which

Table 1
Behavioral Measures

Motor-gestural	
Sharing:	the offering, giving, exchanging, or receiving of an object/toy; or two children cooperating in the use of one object/toy.
Assistance:	a child providing help to another child during a play activity such as pulling another child up from the floor; placing of hands directly upon another child's hands in order for the child to correctly manipulate and/or activate an object/toy.
Affection:	contacts between children such as pats, hugs, holding hands, or other forms of positive physical contact.
Rough-and-Tumble Play:	interactive behavior that includes topographical aggressive behavior, such as tickling, rolling on the floor together, accompanied by positive affect from both participants.
Modeling:	a child's demonstrating part or all of the desired behavior to the learner and having the learner imitate or repeat the action immediately.
Positive Responses:	all cooperative responses involved with sharing a toy; touch with hands, hugs, holding hands, wave or kiss.
Negative Responses:	grabbing an object/toy from another child; destroying construction of another child's; hit, pinch, kick; butt with head, non-playing push or pull.
Vocal-verbal	
Play Organizer:	a child's suggesting, signing, or gesturing an activity, a game, a rule, or assigning (verbally, signing, gesturing) roles to another child so as to initiate or maintain play followed by a response from another child.
Statements:	all neutral declarations which are directed to another child.
Positive Responses:	all positive vocalizations directed to another child as a consequence of his/her behavior.
Negative Responses:	all vocalizations that indicate rejecting, oppositional behavior.
Temporal characteristics	
Initiated:	all discrete motor-gestural and vocal-verbal behaviors that are emitted following a period of 10 s in which the children have not interacted or that begins a new activity not engaged in during the previous 10-s period.
Responded:	all discrete motor-gestural and vocal-verbal behaviors that are emitted within 3 s following the initiation or response of another child and bear a direct relationship to the previous behavior.

no positive social behaviors were observed, the experimenter prompted the nonhandicapped sibling to initiate an interaction. The prompts ranged from least to most intrusive: the experimenter initially provided a verbal cue (e.g., "Make sure he/she is watching you." or "Put his/her hands on the car.") and socially reinforced an appropriate response; if the nonhandicapped sibling did not respond within 10 s of the verbal cue or if he/she had responded incorrectly, the verbal cue was repeated and the experimenter physically prompted the response and then provided social reinforcement.

Training sessions occurred on an average of 5 days per week. No more than two training sessions

occurred on a single day, with 4–6 hr separating any two sessions. The total duration of sessions varied (range, 12–15 min), depending on the siblings' attention. Training sessions for Sibling Pairs 1 and 2 continued until the trained sibling exhibited a level of positive social behavior to the handicapped sibling that equaled or exceeded that directed to the peers during baseline probes. Training sessions for Sibling Pair 3 continued until their levels of reciprocal interactions were stable. Sibling Pairs 1–3 received four (51 min), eight (1 hr, 42 min), and six (1 hr, 18 min) training sessions, respectively.

Handicapped sibling social initiation train-

ing. Procedures designed to increase the handicapped siblings' initiations were implemented with all sibling pairs after the training data for Sibling Pair 1 indicated that the handicapped sibling exhibited few initiations. An incidental teaching format (e.g., Halle, 1982; Hart & Risley, 1975) was used. The experimenter began by noting that the handicapped sibling rarely initiated interactions and suggested that the nonhandicapped sibling might be able to help teach his/her brother/sister how to initiate. The experimenter explained that, rather than allowing the handicapped sibling free access to a desired toy, the nonhandicapped sibling could hold the toy and wait for his/her brother/sister to initiate (verbal request, signs, or gestures) in order to obtain the toy. The experimenter and nonhandicapped sibling subsequently practiced the procedure during role-play sessions in which the experimenter modeled the procedure, then had the nonhandicapped sibling imitate it. The experimenter also suggested that the sibling prompt an initiation by saying "You have to ask for it first" if his/her brother/sister did not initiate an interaction after the toy had been withheld for 5 s. All of the siblings learned the procedure during the first role-play session, although they continued to practice for 2–3 additional sessions.

Response priming. An additional response prompt was employed when generalization probe data indicated that reciprocal interactions between siblings (Pairs 1 and 2) were occurring during less than 50% of the intervals. Specifically, the siblings' mother prompted interactions by reminding them to play like they had been taught by the experimenter. The untrained peers did not receive any instructions other than the general instruction "Go play." No other feedback or instructions were provided by the parent or observers. These sessions lasted for 10 min.

Probes

Free-play probes. Data were taken on an average of 4 times per week during baseline and training. If more than one probe was conducted on the same day, at least 6 hr separated the first and second probe. Prior to any free-play probes, the experimenter spent several sessions becoming

acquainted (e.g., playing) with the children, but provided no consequences for any of the target behaviors.

During free-play probes, the experimenter brought the siblings to the play area and instructed them to play together. At this point, there was no further interaction between the siblings and the experimenter. The experimenter recorded the siblings' social behaviors for a period of 5 min, then informed them that play time was over.

Generalization probes. Generalization probes were also conducted both during baseline and following training. The only differences between these sessions and the free-play probes described previously were the presence of a nonhandicapped peer (for Sibling Pairs 1 and 2), the person instructing the children to play (mother as opposed to experimenter), and the length (10 min as opposed to 5). Because a peer was not available for use with Sibling Pair 3, generalization probes were conducted across settings (on a porch adjacent to the house) rather than to a larger play group.

Stimulus control probes. These probes were conducted both during baseline and following training to assess responses in the absence of the experimenter. The siblings' mother and her "friends" (inter-rater observers who were not present during any other sessions) were present. The mother told the children to play while she and her friends had "coffee" or "talked." During the play period, neither the mother nor the observers provided feedback to the siblings. The observers recorded the children's social behavior for 5 min, after which the siblings continued to play or the mother gave them other instructions.

Follow-up probes. Three follow-up probes were conducted 6 months following the completion of the investigation. These sessions were conducted in the same manner as the probes following the response priming, except that the untrained peer was not present.

Social Validation

Following the completion of all experiments, parents were given a questionnaire to assess the extent of change in social behavior as perceived by significant others (cf. Wolf, 1978). The parents

were asked to score seven questions on a Likert-type scale ranging from 1 (definitely disagree) to 5 (definitely agree). The questions were designed to provide social validation data on the siblings' level of initiations and responsiveness and the extent to which the nonhandicapped sibling made negative statements regarding the training program and/or interactions with his/her brother/sister.

Data Recording and Reliability

A partial interval (10/5 s observe/record) recording system (Powell, Martindale, & Kulp, 1975) was employed. The target behaviors were coded according to who emitted the behavior (the nonhandicapped sibling, handicapped sibling, or peer); what specific social behaviors (sharing, assisting, affection, rough-and-tumble play, play organizer, statements) were used; the topography (positive or negative) of the behavior (excluding play organizer); and temporal characteristic (initiated or responded).

Five trained observers, naive to experimental conditions, were employed during the study. Prior to scoring the experimental sessions, the observers obtained reliability scores of 80% for three consecutive 10-min videotaped pilot sessions. Reliability was assessed on one-third of the observations distributed across each experimental condition. On reliability check days during baseline and training probes, the reliability observer and the experimenter simultaneously recorded the handicapped and nonhandicapped siblings' social behaviors in the playroom. During stimulus control, generalization, and follow-up probes, two observers who had not previously taken reliability data in the baseline and training probe sessions simultaneously recorded the target behaviors. In each case, observers were cued to record or observe by a prerecorded tape.

Occurrence, nonoccurrence, and occurrence/nonoccurrence reliability scores were calculated for reciprocal interactions, overall interactions, and for separate behavior categories by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. An agreement for reciprocal interactions was defined

as both observers recording the same initiator and responder within the same recording interval. For overall interactions, agreements were counted when both observers marked the same behavior, the same initiated or responded dimension, and the same positive or negative response, all within the same 10-s interval on the recording sheet. Thus, overall interaction could include intervals in which only an initiation occurred, while reciprocal interaction included only those intervals in which an initiation was followed (within 3 s) by a response. Agreements on behavior categories were defined as both observers scoring the same behavior category within the same 10-s interval. Mean reliability scores for reciprocal interactions were 95.0% (range, 87.5%–100%), 82.3% (range, 42.3%–90%), and 96.1% (range, 91.6%–100%) for occurrence, nonoccurrence, and occurrence/nonoccurrence, respectively. Reliability scores for each of the above categories when considering overall interactions were 94.1% (range, 86%–100%), 90.6% (range, 83%–100%), and 97.6% (range 90%–100%), respectively. Reliability scores for each behavior category averaged over 90% for occurrence, nonoccurrence, and occurrence/nonoccurrence.

Experimental Design

A multiple-baseline design (Baer, Wolf, & Risley, 1968) across three sibling pairs was used to assess the effects of training on the social behavior of handicapped and nonhandicapped siblings.

RESULTS

Siblings' Reciprocal Interactions

Figure 1 shows the percentage of intervals of positive reciprocal interaction between the handicapped and nonhandicapped siblings during baseline, training, and follow-up probe sessions. Motor-gestural and vocal-verbal behaviors were collapsed because there was virtually no difference in their occurrence; negative behaviors were not included due to their low occurrence. All three sibling pairs exhibited low levels of reciprocal interaction during baseline ($M = 17\%$, 32% , and

Figure 1. Percentage of intervals of positive reciprocal interactions between handicapped and nonhandicapped siblings.

30%, respectively). In each case, training produced a substantial increase in interaction ($M = 73\%$, 76% , and 73% , respectively). Follow-up data reveal that reciprocal interactions continued to occur

at relatively high levels, averaging 88% , 93% , and 90% for Sibling Pairs 1–3, respectively.

Figure 2 shows the percentage of intervals of positive reciprocal interaction during generalization

Figure 2. Percentage of intervals of positive reciprocal interactions during generalization probes.

Table 2
Mean Percentage of Intervals of Social Initiations Produced
by Handicapped (H) and Nonhandicapped (N) Siblings

	Baseline probes	Training probes	Follow-up probes
NS 1	26.9	61.9	71.6
NS 2	42.0	62.0	70.0
NS 3	33.9	62.3	68.3
HS 1	1.0	18.7	22.3
HS 2	1.0	15.0	23.3
HS 3	1.0	12.3	21.6

probes. Baseline data on Sibling Pairs 1 and 2 (who had a peer added to the dyads) indicate that the siblings engaged in low levels of reciprocal interaction ($M = 12.7\%$ and 12.7% , respectively). Following sibling training, interactions between Sibling Pairs 1 and 2 increased above baseline levels even though no training had taken place with the peer present ($M = 31.8\%$ and 28% , respectively).

Because the level of reciprocal interaction was lower than observed during training probes, a response priming procedure was implemented. As indicated in Figure 2, this increased further the percentage of intervals in which the trained siblings interacted, with Sibling Pair 1 averaging 55.3% and Sibling Pair 2 averaging 52.7% . Cross-setting generalization probes during baseline for Sibling Pair 3 showed that the siblings' level of reciprocal interaction averaged 23.6% ; interactions in this

novel setting increased substantially following sibling training.

Siblings' Initiations

A further analysis of the siblings' interaction during baseline and training probes is presented in Table 2, which shows the mean percentage of intervals in which initiations occurred for the handicapped and nonhandicapped siblings, respectively. These data reveal that, during baseline, the nonhandicapped siblings initiated interactions during less than half of the intervals and that the handicapped siblings initiated very few (1% of the intervals) interactions. With the introduction of training, the nonhandicapped children's initiations to their handicapped siblings increased substantially (above 60%); similar increases were evident for the handicapped siblings' initiations (above 12%).

Initiations during generalization probes. Data on level of initiations during generalization probes are presented in Table 3. During the baseline generalization condition, the nonhandicapped siblings initiated few interactions with their handicapped siblings. Generalization probes following training indicate that Nonhandicapped Siblings 1, 2, and 3 increased their levels of initiations.

Data on initiations by Sibling Pairs 1 and 2 following the response priming procedure are also presented in Table 3. These results show that the

Table 3
Percentage of Initiations by Siblings and Untrained Peers during Generalization Probes

	To handicapped siblings			To nonhandicapped siblings			To untrained peers		
	Baseline	Post-training	Post-response priming probes	Baseline	Post-training	Post-response priming probes	Baseline	Post-training	Post-response priming probes
NS 1	3.0	27.9	45.7	—	—	—	50.8	32.9	20.0
NS 2	14.2	36.0	55.8	—	—	—	33.3	31.5	12.5
NS 3	23.3	63.1	—	—	—	—	—	—	—
HS 1	—	—	—	0.0	4.7	9.2	0.0	0.0	0.0
HS 2	—	—	—	0.0	1.0	6.0	0.0	0.0	0.0
HS 3	—	—	—	0.0	15.0	—	—	—	—
UP 1	0.0	6.4	8.3	20.8	15.8	9.0	—	—	—
UP 2	0.0	4.0	4.0	24.2	15.5	17.5	—	—	—

Table 4
Range and Mean Percentage of Initiations Responded to by the Siblings During Training Probes

	Baseline probes		Training probes		Follow-up probes	
	Range	Mean %	Range	Mean %	Range	Mean %
Sibling Pair 1						
Handicapped	11–100	92.8		100	85–100	97.5
Nonhandicapped	0–100	50.0	0–100	92.8	83–100	94.4
Sibling Pair 2						
Handicapped	11–100	75.0	67–100	81.0	92–100	94.8
Nonhandicapped	0–100	75.0		100	83–100	94.4
Sibling Pair 3						
Handicapped	20–100	85.9	0–100	94.3	92–100	97.4
Nonhandicapped		100	0–100	84.1	50–100	86.6

procedure was effective in further increasing Nonhandicapped Siblings 1 and 2’s initiations (45.7% and 55.8%, respectively).

Data on the handicapped siblings’ initiations during baseline generalization probes show that none of the handicapped children initiated interactions with their siblings. In addition, Handicapped Siblings 1 and 2 exhibited no initiations to the untrained peers during baseline conditions. Following sibling training there was a slight increase in the handicapped siblings’ initiations, which increased following the response priming procedure. In contrast, Handicapped Siblings 1 and 2 did not initiate any interactions with the untrained peers.

Similar data were obtained for the untrained peers. They exhibited no initiations to the handicapped siblings during baseline conditions. Following sibling training, Untrained Peers 1 and 2 increased slightly their initiations. Untrained Peer 1’s initiations increased further to 8.3% following the response priming procedure, whereas initiations by Untrained Peer 2 remained at 4%.

Siblings’ Responsiveness

A further breakdown of the siblings’ interactions during baseline and training probes is shown in Table 4. Presented in this table are the range and mean percentage of social initiations produced by handicapped siblings (nonhandicapped siblings) that the nonhandicapped siblings (handicapped

siblings) responded to positively across probe sessions. During baseline, the results indicate that both siblings typically responded to initiations. Training probes showed that the siblings’ responsiveness to initiations increased (Nonhandicapped Siblings 1 and 2; Handicapped Siblings 1, 2, 3) or decreased slightly (Nonhandicapped Sibling 3).

Responsiveness during generalization probes. Table 5 presents the siblings’ responsiveness toward initiations during generalization probes. During baseline, the nonhandicapped siblings had no opportunities to respond because the handicapped siblings did not initiate interactions. Following training, the nonhandicapped siblings responded to all of the handicapped siblings’ initiations. Their responsiveness remained at 100% following the response priming procedure. Table 5 also shows that when the nonhandicapped siblings initiated interactions, their siblings usually responded. Responsiveness remained at above 80% during subsequent experimental conditions.

During baseline generalization probes, the handicapped siblings did not have an opportunity to respond to the untrained peers because they did not initiate an interaction. Generalization probes following the sibling training procedure indicate that the untrained peers did initiate interactions and that the handicapped siblings were responsive. Their levels of responsiveness were maintained throughout the subsequent conditions. Data on the levels of interaction between nonhandicapped sib-

lings and peers (Tables 3 and 5) demonstrate that, overall, the levels of interactions decreased slightly from the generalization baseline condition to the response priming condition. However, the data also show that the majority of interactions were reciprocal across all experimental conditions.

Probes for Stimulus Control

Probe sessions were also conducted in order to assess the occurrence of reciprocal interactions in the absence of the experimenter. These data showed that reciprocal interactions between the siblings were approximately equivalent to the baseline and training probes conducted by the experimenter. Baseline probes averaged 20.5%, 25%, and 30%; training probes averaged 72.5%, 77.5%, and 78.3% for Sibling Pairs 1-3, respectively.

Social Validation

Parent ratings on the 1 (strongly disagree) to 5 (strongly agree) scale showed that all of the parents rated each sibling pair as engaging in more positive interactions following participation in the training program ($M = 4.67$; range, 4-5). The parents also rated the handicapped siblings as being more responsive ($M = 4.0$; range, 3-5) and more likely to initiate interactions ($M = 3.33$; range, 2-5) than they were prior to training. Similar ratings were obtained on questions pertaining to the nonhandicapped siblings' responsiveness and initiations ($M = 4.33$ and 4.0; range, 3-5 and 4-5, respectively). Ratings on negative statements expressed by the nonhandicapped children with respect to interactions with their handicapped siblings showed that two of the parents rated the question 1 (strongly disagree that negative statements were expressed following training), while the third parent rated the question 3 (somewhat disagree).

DISCUSSION

In recent years, increasing emphasis has been placed on siblings of handicapped children, and how the presence of a handicapped child in the family affects the traditional role of siblings. Although many investigators have examined the psy-

Table 5
Percentage of Initiations Responded to by Siblings and Untrained Peers during Generalization Probes

	To handicapped siblings						To nonhandicapped siblings						To untrained peers					
	Baseline			Post-training			Baseline			Post-training			Baseline			Post-training		
	Mean	Range		Mean	Range		Mean	Range		Mean	Range		Mean	Range		Mean	Range	
NS 1	*			100									100			100		
NS 2	*			100									100			100		
NS 3				100									N/A			N/A		
HS 1							100			94.5	91-100		98.3			83.3	0-100	
HS 2							95.0	75-100		94.1	85-100		85.0			100		
HS 3							82.6	75-100		100			N/A			N/A		
UP 1	*			*			100			100			100					
UP 2	*			*			100			100								

* No opportunity to respond.

chological functioning of siblings of handicapped children (Breslau, Weitzman, & Messenger, 1981; Cleveland & Miller, 1977; Grossman, 1972; Schwirian, 1976), our study represents one of the few attempts to evaluate empirically a program for increasing reciprocal social interactions of handicapped and nonhandicapped siblings.

The detailed analyses of initiations and responsiveness produced some interesting results. The baseline data for the handicapped siblings showed that their major deficit was initiations rather than responsiveness. In other words, although the handicapped children rarely initiated interactions with their siblings, they did respond appropriately to initiations made by their siblings. This analysis led to the inclusion of the incidental teaching procedure. Previous research on social interaction between handicapped children and siblings or peers has not taught trainers how to use incidental teaching strategies. The nonhandicapped siblings in the present study easily acquired the requisite skills, and the incidental procedures appeared to be effective in increasing the handicapped siblings' initiations.

Analysis of the siblings' baseline data showed that the nonhandicapped siblings rarely initiated interactions. This is somewhat surprising given that the handicapped siblings responded positively to the few initiations made by the nonhandicapped siblings. It is possible that the responsiveness of the handicapped siblings during baseline had been preceded by a long history in which initiations by the nonhandicapped siblings were not reinforced. The few initiations by the nonhandicapped siblings during baseline may not have resulted in the repeated pairing necessary to establish the handicapped siblings' responses as reinforcing. The direct prompting training strategy was successful in increasing sibling initiation because the siblings were prompted to initiate at a high rate; initiations were reliably followed by responses from the handicapped siblings. Thus, the presence of the handicapped siblings may have become discriminative for reinforcement (i.e., reciprocal interaction).

The detailed analyses conducted in the present investigation have not been consistently used in the

social interaction literature. These types of analyses are important because they can be used to design intervention procedures to correct specific social skill deficits. In the present study, for example, it is possible that increases in social interaction would have occurred if initiations had been the only skill selected for training, because it was the skill most lacking in the siblings' interactions.

The data also showed that the interactions between siblings generalized to larger play groups (Sibling Pairs 1 and 2) and across settings (Sibling Pair 3). The common stimuli present during training and generalization probes may have contributed to generalization by reducing the discriminability of the two conditions (Stokes & Baer, 1977). Although positive, the generalization data must be interpreted cautiously because generalization probes were collected (for two of the sibling pairs) in the same environment in which training occurred. Future research should assess whether social skills generalize to a variety of situations that differ from the setting in which training occurred.

Although the levels of reciprocal interaction for Sibling Pairs 1 and 2 were found to generalize to larger play groups, these levels were not as high as that found during the training probes. A variable that may have contributed to this finding was the presence of the untrained peer. From a practical standpoint, it is possible that the untrained peers' initiations and responses to the nonhandicapped and handicapped siblings resulted in fewer opportunities for the siblings to interact. The mother's verbal instruction served as a response prompt for the siblings to engage in the behaviors taught previously.

These results also revealed that the untrained peers increased their levels of initiations toward the handicapped siblings despite the fact that they had not received any direct training. It is possible that the untrained peers' initiations increased as a result of observing the increased reciprocal interactions of the siblings and then imitating some of the nonhandicapped siblings' behavior (e.g., prompting, initiating). The handicapped siblings were responsive to the untrained peers, thus increasing the likelihood of continued interactions. These data

replicate the findings of other studies showing "spillover" effects (Shafer et al., 1984; Strain, Shores, & Kerr, 1976).

Despite data showing that the level of reciprocal interactions between Handicapped Siblings 1 and 2 and Untrained Peers 1 and 2 increased above that found during the generalization baseline, the data also revealed that the handicapped siblings did not initiate interactions with the untrained peers. The lack of initiations by the handicapped siblings may have been a result of the way in which the training procedure reinforced reciprocal interactions between the handicapped and nonhandicapped siblings. Furthermore, the untrained peers did not use the incidental teaching procedure employed by the nonhandicapped siblings, thus decreasing the probability that the handicapped siblings would initiate interactions. Including additional persons in the training phase is one strategy that might have alleviated this problem. This would have provided the handicapped sibling with additional opportunities to engage in and be reinforced for appropriate social behavior. Such an approach (multiple exemplar training) has been recently used to program generalized interactions between handicapped and nonhandicapped peers (Fox et al., 1984).

The behavioral characteristics of the children who participated in this study may have influenced the outcomes. Program modifications may be required for use with participants who exhibit high-frequency disruptive behaviors and/or do not display toy play, imitation, and instruction-following skills. In such cases, training programs may have to focus on the use of specific reinforcement strategies (e.g., differential reinforcement of other behaviors, differential reinforcement of incompatible behaviors) and prompting techniques.

Finally, the long-term effects of sibling training programs on the siblings have not been assessed empirically. Previous research on siblings of handicapped children has indicated that nonhandicapped siblings may perceive themselves as having greater caretaking and supervision responsibilities than children whose siblings are not handicapped (Farber & Ryckman, 1965). Thus, increased pres-

sure, especially if the training responsibilities are time consuming, may be placed on the nonhandicapped sibling as a result of training. Parent ratings collected for this study suggest that negative statements occurred occasionally for one of the three nonhandicapped siblings and highlight the importance of including in future research direct measures of the effect of training programs on the behavior of the trained siblings.

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