

PROMOTING RECIPROCAL INTERACTIONS VIA PEER INCIDENTAL TEACHING

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This study evaluated peer incidental teaching as a strategy for increasing reciprocal peer interactions by children with autism. Three typical preschoolers were trained as peer tutors for 3 young children with autism. During a classroom free-play session, peer tutors used incidental teaching to obtain verbal labels of preferred toys by children with autism. A multiple baseline across the 3 target children showed replicated positive effects of the intervention. Adult supervision and assistance were then faded systematically, with resulting maintenance of increased reciprocal interactions. Multiple measures of the extent and limits of generalization suggested that 1 child increased interactions in free-play periods throughout the day, but none of the children showed increases at lunch. Teacher and peer ratings supported the social validity of positive findings.

DESCRIPTORS: peer interactions, incidental teaching, autism, preschool intervention, social skills

If the goal of lifelong community integration is to become meaningful for children with autism, the normalization of their social behavior must begin at an early age. Direct and intensive instruction is required to promote interactions between children with autism and their typical peers (Strain, 1990). Integrated classroom placement, without direct peer intervention, does not yield substantial social gains by children with severe disabilities (Guralnick, 1976). Consequently, various technologies have been developed to promote social interactions (Odom & Strain, 1984). Most commonly, intervention consists of typical peers receiving instruction in how to interact with children with disabilities (Gunter, Fox, Brady, Shores, & Cavanaugh, 1988; Odom, Hoyson, Jamieson, & Strain, 1985; Ragland, Kerr, & Strain, 1978; Strain, Kerr, & Ragland, 1979). Alternatively, children with disabili-

ties also have been taught to interact with typical peers (Brady et al., 1984; McEvoy et al., 1988). Hodgens and McCoy (1990) combined adult coaching of withdrawn preschoolers with preparation of confederate peers.

Procedures for teaching integrated peer interactions have been more successful in promoting initial acquisition than in yielding generalized and durable improvements (Odom & Strain, 1984). It is possible that generalization problems occur because instruction usually is conducted under such highly controlled contexts that the target skills come under the tight stimulus control of those contexts. For instance, instruction often is provided in a distraction-free setting. Further, it may be that artificially high levels of teacher contact are counterproductive to achieving transfer to play situations (Cole, Meyer, Vandercook, & McQuarter, 1986; Meyer et al., 1987; Strain & Fox, 1981).

Researchers have now begun to identify a number of instructional components that appear to facilitate generalization, including peer preparation in the less contrived setting of a free-play area (Shafer, Egel, & Neef, 1984), use of multiple peer trainers (Brady, Shores, McEvoy, Ellis, & Fox, 1987), and incorporation of highly preferred games and leisure objects (Gaylord-Ross, Haring, Breen, & Pitts-Conway, 1984). Strain (1983) demonstrated that

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typical peers must be regularly available in order for children with autism to maintain new social interaction skills.

For the most part, these advances in generalization programming have occurred with school-aged children. It remains unclear whether typical preschoolers, whose own social abilities are just emerging, can be as successful in continuing integrated interactions in the absence of adult assistance.

One promising avenue for intervention is incidental teaching, which has been shown to enhance generalization of language in young typical children (Hart & Risley, 1968, 1975) and in children with autism (McGee, Krantz, Mason, & McClannahan, 1983; McGee, Krantz, & McClannahan, 1985). Although sometimes conceptualized as "loose teaching" (Stokes & Baer, 1977), incidental teaching procedures consist of a prespecified chain of child-teacher interactions. When generalization occurs, it is probably derived from teaching multiple examples of desired behavior within ongoing stimulus conditions, which are the same conditions under which responses later will be cued and reinforced. Moreover, anecdotal reports have suggested that young children, both with and without autism, increase requests for objects that have been used in incidental teaching (Hart & Risley, 1975; McGee, Krantz, & McClannahan, 1986). Because children with autism display characteristic deficits in social initiations, there may be a special potential for procedures that yield by-products of increased initiations.

The purpose of this study was to analyze the efficacy of incidental teaching as an intervention designed to promote reciprocal peer interactions among children in a socially integrated preschool. Of interest were both direct effects on the social interactions of typical peers, acting as tutors, as well as any collateral effects on social initiations and responses of children with autism.

METHOD

Participants

Participants included 3 boys with autism and 5 children of typical abilities, 3 of whom served as

peer tutors and 2 as comparison subjects. All participants were enrolled in an integrated preschool program, which was composed of 6 typical children, 2 children with attention deficit disorder, and the 3 boys with autism.

Children with autism were selected on the basis of availability, irrespective of their levels of functioning or the duration of treatment (i.e., 2 months for Ian, 10 months for Max, 5 months for Sam). At the onset of the study, Ian was 3 years 7 months old, Max was 4 years 1 month old, and Sam was 5 years 11 months old.

Peer tutors were 3 girls, who ranged from 4 years 5 months to 4 years 11 months old. Peer tutors were selected on the basis of (a) age (oldest of enrolled typical children), (b) regular preschool attendance, (c) teachers' reports of generally high levels of compliance and age-appropriate social skills, and (d) high status among peers (according to teacher ratings and peer sociometrics). In addition to the 3 typical peer tutors, 2 comparison children, selected randomly, were younger typical children (a boy, aged 3 years 6 months, and a girl, aged 3 years 11 months).

Setting and Materials

The study took place during regularly scheduled activities at a socially integrated preschool. Peer tutor training and peer incidental teaching occurred during 5-min sessions that took place during a mid-morning (11:00 to 11:45 a.m.) free-play period. In the same area, nonparticipating children were engaged in varied and sometimes competing play activities, such as block-building, dressing up, or driving trucks.

During baseline, lunch probes, and the final fading phase, a regular teacher (untrained in supervising peer teaching) rotated his or her contacts among all classroom children in accordance with ongoing routines for incidental teaching of language. Specifically, the regular classroom teacher provided approximately nine contacts to support engagement and five language-instruction opportunities within each 5-min period. Teacher contacts were distributed relatively equally among children with and without disabilities. Classroom teachers

were given no specific training related to peer interactions, except for a general instruction that they should not interrupt ongoing peer interactions. During intervention and the first fading phase, a doctoral-level experimental teacher was responsible for coordinating the peer incidental teaching.

Teaching materials used by peer tutors consisted of toys that had been selected in a reinforcer assessment procedure similar to that described by Shafer et al. (1984). Preferred toys were placed in a plastic bucket, which was brought into the free-play area at the beginning of each session. Materials used by the experimental teacher for training the peer tutors included small (15 cm by 20 cm) clipboards and training checklists, similar to those used in performance appraisals of adult teachers in the classroom. Training checklists were comprised of three picture prompts corresponding to the components of the incidental teaching process, with space adjoining each prompt for the delivery of checkmark(s).

Design

The effects of peer incidental teaching on reciprocal interactions were evaluated in a multiple baseline across the 3 target children. Experimental conditions included baseline, training of peer incidental teaching, and two fading phases. Normative data were obtained on levels of unprompted interactions among the 3 peer tutors, and measures were taken on adult interactions. Additional global measures of social competence were obtained before and after intervention.

Procedure

Peer training for incidental teaching. Peer tutor training was accomplished in the context of the tutoring session between the peer tutor and the target child while other free-play activities were taking place. Prior to training, each peer tutor was informed that she had been chosen as a teacher for a specific child, and was told she would later receive a "teacher break" if she did a good job. Instructional sessions took place for 5 min once each day, to ensure that the activity remained easy and enjoyable for both the peer tutor and the target child.

Immediately prior to each 5-min session, the experimental teacher told the peer tutor and the target child it was time to come play together, and she presented the peer tutor with the bucket of toys that were highly preferred by the target child. The experimental teacher sat on the floor with the peer tutor and the target child and showed the peer tutor how to conduct each step of the incidental teaching process.

The peer tutor was provided as much instruction, modeling, and assistance as needed to deliver the following sequence of an incidental teaching interaction: (a) Wait for the target child to initiate a request for (i.e., reach for) a toy, (b) ask the target child for the label of the toy ("Say duck"), (c) give the toy to the target child when he labeled it, and (d) praise the correct answer ("That was great! You said duck"). Peer tutors also were trained to prompt the target child to take turns in order to create additional incidental teaching opportunities. For example, after allowing her student to play with a toy, the peer tutor would ask if she could have a turn.

During early sessions, approximately every other teaching episode was one modeled by the experimental teacher. As the peer tutor began to display some of the teaching components, use of the checklist gradually replaced adult modeling. Thus, the experimental teacher showed the peer tutor the picture prompt checklist for each component of the incidental teaching process, and she praised the peer tutor and marked the checklist with a check as each component was completed accurately.

To keep the interactions as successful as possible, objects were limited to those the target child could already label for adults. The experimental teacher provided any assistance necessary to keep the target child in the teaching area (e.g., if the target child got up to leave, the experimental teacher took him gently by the hand and returned him to the teaching area).

Within an hour of the teaching session, the peer tutor was offered a "break" in the snack area. For the first tutor, the break initially consisted of a brief informal chat with the experimental teacher; as additional peers assumed tutoring roles, the breaks

became a brief gathering among the peer tutors. After a couple of weeks the break component was eliminated.

After all pairs were involved in the intervention for at least eight sessions, tutors were arbitrarily rotated among target children, a practice that offered the potential advantage of programming for generalization by providing multiple exemplars of peers. The rotation of tutors also provided each peer tutor with the opportunity to interact with target children who were more or less likely to be responsive.

Fading 1. The experimental teacher reduced her active involvement when the peer tutor demonstrated the ability to conduct each component of the incidental teaching process without prompting. Although all peer tutors had immediately increased their initiations to target children at the onset of training, peer tutor training continued until the tutor successfully prompted responses from the target child on an average of at least 45% of opportunities across nine consecutive sessions.

The experimental teacher introduced the sessions as before, delivering the bucket of toys to the peer tutor. However, she then moved to the corner of the room, away from the pair. From this position, she would nod approval and occasionally approach to unobtrusively pat or briefly praise the children for playing well together. The teacher also intervened to encourage the peer tutor and the target child to interact whenever there was more than 1 min without either a formal peer incidental teaching episode or an unplanned play interaction. Throughout this phase, the peer tutors and the target children often took turns playing with the toys rather than conducting formal incidental teaching, a practice that met with approval from the teacher as long as periodic social interactions continued.

By the last session of this phase, checklist-based feedback to peer tutors was discontinued. However, because the clipboards were "high-status" items (having been associated with the peer tutors as well as with ongoing training of adult teachers), the miniature teaching clipboards were distributed non-contingently to other nonparticipating children,

many of whom had been watching the daily sessions.

Fading 2. After at least three sessions of the Fading 1 phase described above, and when interactions continued throughout sessions without direct prompting, the experimental teacher was no longer present in the room. From this point on, the regular classroom teacher managing the free-play area was asked to deliver the bucket of toys to the peer tutor, along with a statement like, "Here are the toys that you and Ian may play with." If the peer tutor did not respond to the initial prompt, the classroom teacher provided a similar second indirect prompt. The teacher then left the bucket of toys in the proximity of the peer tutor and resumed rotations about the classroom.

Regular classroom teachers were asked to note any episodes of incidental teaching or play interactions that occurred during the day and to report these to the experimental teacher. At the end of the school day (1:00 p.m.), when indicated, the experimental teacher came in to remark casually to the peer tutor that she was pleased to have heard that the peer tutor had been playing with a target child during the day.

Direct Observations and Measurement

Videotaped data base. Throughout baseline, peer training, and fading conditions, 5-min videotaped observations of each target child were obtained daily during a mid-morning free-play period (11:00 to 11:45 a.m.). In addition, 5-min probes were available from ongoing classroom videotaping of free-play periods held throughout the day, as well as from lunch. Because videotaping procedures were continuous in the classroom, with a 5-min sample taped during every 15-min period of the day, children did not react to the presence of the camera.

Generalization probes were scored from samples obtained during both baseline and fading. Although there was some variability in the number of free-play probes available for each child, an average of 10 free-play probes and 7 lunch probes were scored for children with autism before and

after peer training. Normative data were comprised of an average of eight free-play probes and three lunch probes for each peer tutor.

Social interaction codes. The measurement procedures used in this study were adapted from observational systems reported by Strain, Shores, and Timm (1977) and by Shafer et al. (1984). Operational definitions were available for two topographical categories of social behavior (motor/gestural and verbal/vocal) as well as for two functional categories (positive and negative social behaviors). In addition, behaviors were coded as initiations or responses, based on temporal characteristics of the behavior. It should be noted that all interactions, including but not limited to formal incidental teaching episodes, were scored on this system.

Adult interactions with the target child were coded in a manner similar to those for child interactions. The data sheet included a space for noting the initials of the adult or child involved in each interaction with the target child.

Scoring and analysis. Daily 5-min videotaped sessions were scored by 1 of 4 observers. An audiotape signaled continuous 10-s intervals, during which all applicable social interaction codes were circled in the corresponding interval on the data sheet. Data were later transformed to a measure of children's positive reciprocal interactions, in order to represent the distribution of children's social behaviors (including the giving and receiving of interactions by both typical children and children with autism). The term *reciprocal interaction* was selected to underline the bidirectionality of the social interchange, and computation of a reciprocal interaction was based on the occurrence of a positive child initiation to or from a target child, followed by a positive child response from or to a target child during the same or next interval (verbal and gestural behaviors combined).

Teacher interactions were scored for either an adult initiation or an adult response to the child, irrespective of the positive/negative or verbal/gestural categories. Scoring of teacher interactions was independent of scoring for concurrent child behaviors (i.e., a child did not necessarily have to respond

to the teacher in order to code the occurrence of a teacher's initiation). The distribution of social interaction (reciprocal child or teacher interaction) across the videotape segment was computed as the percentage of intervals in which an interaction occurred.

Observer training and interobserver agreement. Prior to scoring data for this study, observers were required to achieve higher than 85% agreement with master test videos. The components of reciprocal peer interactions and the interactions with teachers were scored for occurrence or nonoccurrence. During reliability observations, the observers scored the videotaped session in separate viewings. Observations were synchronized by a "Ready, begin" signal dubbed onto the videotape, at which point an audiotape was started to signal continuous 10-s intervals. Interrater agreement was computed by dividing agreements by agreements plus disagreements and multiplying by 100.

Interobserver agreement was assessed on 22.8% of all observations, and at least one reliability session was conducted for each participant during each condition. Average overall agreement was 95% (range, 89% to 100%) across children. Average reliability for response components was 95% (range for occurrences was 73% to 82%, range for non-occurrences was 97% to 99%).

Teacher Ratings of Social Competence

Using the Pictorial Scale of Perceived Competence and Social Acceptance for Young Children (Harter & Pike, 1980, 1984), classroom teachers rated each child on dimensions of cognitive competence, physical competence, and peer acceptance. Ratings were obtained pre- and postintervention over a 5-month period.

Peer Sociometric Ratings

Using a picture rating sociometric measure (Asher, Singleton, Tinsley, & Hymel, 1979), the 3 peer tutors and the 2 typical comparison children participated in evaluations of each other and of the 3 target children. Each child met individually with a research assistant, who provided a series of pho-

Percentage Of Intervals Scored For Reciprocal Peer Interactions

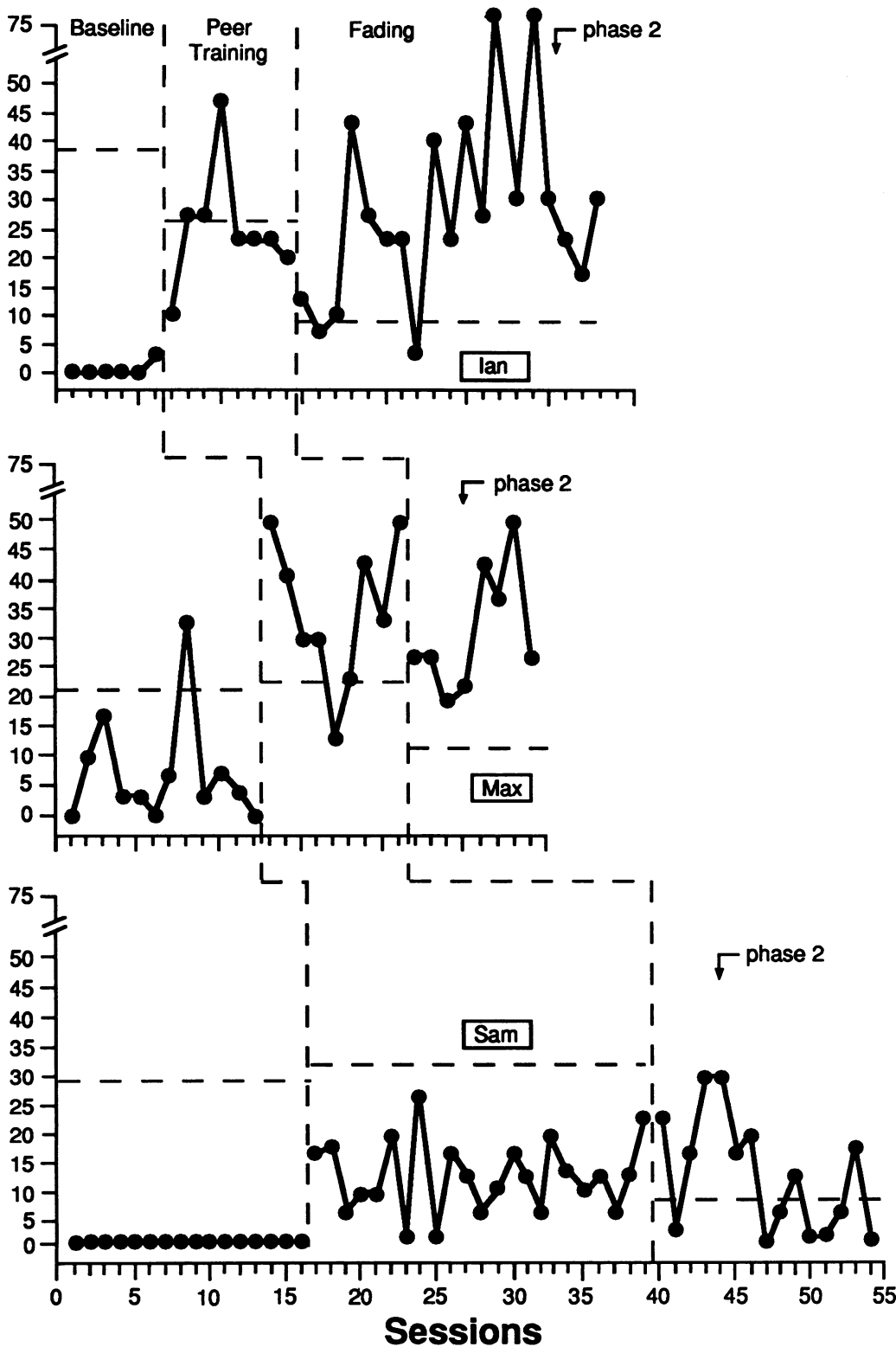


Figure 1. Percentage of intervals scored for reciprocal interactions by 3 children with autism during baseline, peer incidental teaching, and fading conditions. The dashed horizontal lines indicate the mean levels of teacher interactions.

tographs of children to be rated. The sociometric task involved the use of three boxes with openings that were labeled with drawings of a happy face, a neutral face, or a sad face. The child providing the rating was requested to "Put the picture of (name of classmate) in the box with the picture that shows how much you like to play with him or her." Ratings were credited as 0 for each sad face, 1 for each neutral face, and 2 for each happy face. The first set of ratings was obtained during early baseline, and final ratings were obtained approximately 5 months later.

RESULTS

Figure 1 shows that children's reciprocal interactions, consisting of an initiation to or from a target child *and* a response to the initiation, increased with peer training. Maintenance continued after the intervention was withdrawn in the first fading phase. In the Fading 2 phase, with the experimental teacher absent, 2 children's reciprocal interactions were maintained at intervention levels.

Specifically, the mean percentage of intervals scored for positive reciprocal interactions for Ian increased from 1% during baseline to 25% during the peer training intervention; Max showed mean baseline-to-intervention increases of 7% to 35%, and Sam's mean level of interactions increased from 0% to 13%. Elevated interactions continued for all 3 children throughout the first fading phase, with mean interaction levels at 31%, 25%, and 21%, respectively. During the final fading phase for all 3 children, interactions continued over baseline (25% for Ian, 41% for Max, and 9% for Sam). In comparison, the mean percentage of intervals scored for reciprocal interactions by the 3 peer tutors, during unstructured free-play sessions in the same setting, was 31% (range, 30% to 35%).

To control for the possibility that systematic increases in rates of adult interactions with target children could have accounted for improvements, data on adult interactions were analyzed across all conditions. Levels were similar during baseline and intervention, averaging 29% of intervals during baseline and 30% during peer training. As intended, levels of adult interaction were reduced to 16%

Table 1
Mean Percentage of Intervals Scored for Initiations

	Initiations to target				Initiations from target			
	BL	PT	F1	F2	BL	PT	F1	F2
Ian	4	23	34	52	0	21	10	10
Max	4	38	29	47	12	7	7	10
Sam	0	30	28	24	0	3	5	0

Note. BL = baseline; PT = peer training; F1 = Fading 1 phase; F2 = Fading 2 phase.

during the first fading phase and to 11% during the final fading phase. Moreover, levels of adult interaction during fading conditions were similar to levels of adult interaction with typical children during unstructured free play ($M = 18\%$; range, 17% to 19%).

Peer initiations to all 3 target children increased following introduction of peer incidental teaching, from an average of 3% of intervals during baseline to an average of 30% of intervals during peer training (Table 1). Initiations to target children were maintained across fading phases ($M = 30\%$ in Fading 1 and $M = 41\%$ in Fading 2), and Ian and Max received even higher levels of initiations from peers in the final fading condition than they had received during intervention. One of the children with autism also showed increases in initiations to peers, with increases maintained across both fading phases for Ian. Starting with a comparatively high baseline, Max showed no increases in levels of initiations to peers, and Sam showed minor but inconsistent increases during peer training and the first fading phase.

Data on the response component were more difficult to evaluate due to few initiations during baseline. However, there were increases in responsiveness to initiations from both target children and peer tutors. Other children responded positively to 40% of the initiations by children with autism during baseline, and others responded to 73% of target initiations during the fading conditions. Target children responded positively to 43% of peer initiations during baseline and to 57% of initiations from other children during fading.

Max increased his reciprocal interactions during free-play periods at other times of the day, in the absence of both the experimental teacher and the

toys used during the intervention. During baseline, reciprocal interactions involving Max were scored on an average of 7% of intervals; following peer training, reciprocal interactions were scored for this child on an average of 21% of intervals. Ian and Sam showed no generalization to free-play periods at other times of day, and none of the target children showed changes in interactions during lunch. However, normative data on typical children in the same setting indicated that peer interactions during lunch were consistently lower than during free play (averaging 13% of intervals); some of the typical children rarely interacted during lunch (average range across typical children was 3% to 31% of intervals).

Teachers' ratings of social competence, obtained during a 5-month period (pre- and postintervention), reflected higher evaluations in peer acceptance for 2 of the 3 target children as well as for the peer tutors and comparison children. The teachers' final ratings of Ian and Max fell within normative ranges.

The results of peer sociometric ratings, obtained before and after intervention, showed positive increases in peer ratings across the 5-month period. The average peer rating (on a scale of 0 to 2) for typical children was 1.28 during baseline and 1.56 following intervention. However, increases in peer ratings were greater for the target children, changing from a mean rating of 0.56 during baseline to a mean rating of 1.33 following the intervention and fading.

DISCUSSION

Peer incidental teaching was effective in promoting reciprocal interactions among children with autism and their typical peers, and there was evidence of maintenance across conditions of faded teacher intervention. Thus, by giving typical children "something to say" that would get a response from their peers with autism, the typical children's initiations and responses to children with autism increased. Perhaps more importantly, although the experimental teacher intervened only with the peer tutors, the tutors, in turn, increased responses from all of the children with autism and increased initiations by one of the target children.

Maintenance may have been facilitated by procedural variables related to child and adult intervention. Children were prepared as peer tutors in the context of the naturally occurring competing distractions intrinsic to a free-play setting (Stokes & Baer, 1977). Because the incidental teaching procedures were not rigidly structured, the peer tutors often seemed to forget their "teaching responsibilities" as they became engaged in play with the target child and mutually interesting toys, an outcome viewed as highly desirable. Finally, the normative data on typical children's levels of reciprocal interactions indicated that the intervention did not promote unnaturally high levels of interaction between children with autism and their peers.

Data on the adult intervention showed clearly that levels of adult direction were systematically introduced and faded in accordance with the experimental design. It is noteworthy that the levels of adult interaction were inversely related to peer interactions, with the exception of the initial peer training condition. Therefore, after initial promotion of interactions, adults appeared largely to preempt interactions. Although adult involvement during the final fading phase was not completely absent, procedures such as giving a child a bucket of toys and reporting on the child's play to another teacher at the day's end seemed well within the boundaries of feasibility for even the busiest pre-school teachers.

It may well be argued that the generalization that occurred was in fact programmed into the procedures (i.e., the clipboards used for peer training and the bucket of toys became stimuli available in the classroom); this is consistent with prior findings that generalization of social interactions occurs only when directly programmed (Brady *et al.*, 1987; Gaylord-Ross *et al.*, 1984; Shafer *et al.*, 1984; Strain, 1983). However, because incidental teaching is procedurally an intervention package and component analyses were not conducted, it is not possible to specify which procedural steps accounted for the results.

The most direct evidence for generalization was in Max's transfer to free-play situations in which no external prompts were operating, and unre-

ported data sources indicated that these social improvements were meaningful and long-lasting. Limited effects for Ian may have been due to his recent entry into treatment prior to the intervention, and Sam was considerably older than the other children.

Teacher and peer ratings lent social validity to objective findings. Attitudinal improvements toward all 3 target children were of special importance in a socially integrated classroom. Significantly, the classroom popularity of the peer tutors was maintained following their increased interactions with the children with autism. These findings were congruent with prior research, which showed benefits of enhanced attitudes toward peers and higher self-esteem in children acting as peer tutors (e.g., Devin-Sheehan, Feldman, & Allen, 1976).

It is possible that the incidental teaching process serves to reinforce a chain of social interaction behaviors, concurrent with, yet independent of, the designated teaching target (e.g., object labels). Findings on the limits of generalization suggest the need for procedural refinements, or perhaps for specification of "readiness" criteria and methods for preparing children with autism to participate in this type of intervention. Notwithstanding the need for future research, the present data confirm the viability of peer incidental teaching as a social interaction intervention package.

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