JOURNAL OF APPLIED BEHAVIOR ANALYSIS 1995, 28, 285–295 NUMBER 3 (FALL 1995)

INCREASING COMPLEX SOCIAL BEHAVIORS IN CHILDREN WITH AUTISM: EFFECTS OF PEER-IMPLEMENTED PIVOTAL RESPONSE TRAINING

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Two children with autism were taught to engage in a variety of complex social behaviors using peer-implemented pivotal response training (PRT), a set of procedures designed to increase motivation and promote generalization. Typical peers were taught to implement PRT strategies by modeling, role playing, and didactic instruction. After training, peers implemented the procedures in the absence of direct supervision in a classroom environment. After the intervention, both children with autism maintained prolonged interactions with the peer, initiated play and conversations, and increased engagement in language and joint attention behaviors. In addition, teachers reported positive changes in social behavior, with the largest increases in peer-preferred social behavior. Further, these effects showed generality and maintenance. Implications of these findings are discussed.

DESCRIPTORS: autism, social behavior, peer trainers, naturalistic interventions, school setting

Children with autism are well known for their profound deficits in social behavior and social competence. Failure to acquire and generalize certain complex social behaviors may be related to the motivation deficits also noted in this population. A technique that has been shown to increase the motivation of children with autism, as well as to enhance generalization, is pivotal response training (PRT; e.g., Koegel, Koegel, & Schreibman, 1991; Koegel, O'Dell, & Koegel, 1987; Laski, Charlop, & Schreibman, 1988). PRT incorporates a set of specific procedures that may be conceptualized in terms of establishing operations (Michael, 1993), because they provide contextual variables that enhance the reinforcing value of stimuli. Thus, the procedures incorporated into this training include allowing a significant amount of choice over the nature of the interaction and stimulus materials, reinforcing attempts to respond, varying tasks frequently, and so forth. In addition to setting up these establishing operations, the procedures are more natural because they more closely resemble typical interactions and are utilized in ongoing, natural activities.

Naturalistic or loose training techniques (e.g., those that are conducted in loosely controlled contexts, that provide multiple exemplars, and that incorporate the target child's preference into the teaching interaction), such as PRT, have been traditionally used to increase the language skills of children with autism. Recently, these techniques have been adapted to increase other complex behaviors, such as symbolic play (Stahmer, 1995) and sociodramatic play (Thorp, Stahmer, & Schreibman, 1995). A similar naturalistic technique, incidental teaching, has been shown to increase the social skills of these children (McGee, Almeida, Sulzer-Azaroff, & Feldman, 1992). McGee et al. showed that young, typical peers could effectively implement incidental teaching strategies to increase reciprocal interactions with their schoolmates with autism. This finding is important because it suggests that loose training techniques are not only effective but also can be

This research was supported by U.S.P.H.S. Research Grants MH39434 and 28210 from the National Institute of Mental Health. Special thanks to Becky Wright, Anette Warren, Carol Gibson, Maura Williams, and the exceptional students and staff at Walker Elementary School in San Diego.

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implemented by peers, a population that has great potential to produce behavior change in their schoolmates with autism. More research, however, is necessary to examine the collateral effects of naturalistic strategies (e.g., areas related to social skills, such as language and attention) and to determine whether this procedure can be effectively implemented with low-functioning children with autism.

Although research shows that children with autism can be taught to respond to initiations (e.g., Odom, Hoyson, Jamieson, & Strain, 1985), complex social behaviors such as initiating play and conversation typically remain low. Pilot research (Pierce, 1993) using PRT to increase the social skills of a child with autism indicated that this procedure was highly effective in increasing complex social behaviors, such as initiations.

In addition to the requisite behaviors needed for the occurrence of social interactions (e.g., responding and initiating), more subtle behaviors, such as joint attention (shifting attentional focus between object and interactant), are important for maintaining social interactions (Loveland & Landry, 1986) but are rarely assessed in traditional social skills interventions. The skill of coordinating attention with a social partner is a major developmental milestone and is normally achieved by 12 to 15 months of age (Bakeman & Adamson, 1984) but is a well-documented deficit reported in autism (Landry & Loveland, 1988; Loveland & Landry, 1986; Mundy, Sigman, & Kasari, 1990). To achieve this major milestone, babies need to do more than simply focus their attention on a single, salient aspect of an object or person; they need to follow the unpredictable and rapid flow of human social activity, including words, gestures, sounds, expressions, and actions with objects. Techniques such as PRT that direct attention towards objects and events in the natural environment may have benefits not only for the development of social skills of children with autism per se but also may assist in the development of more normalized attention behaviors.

The potential effectiveness of PRT in establishing and maintaining a repertoire of social behavior may be greatly enhanced if it is implemented in a school setting by typical peers. In addition, investigating this type of naturalistic procedure is important because of its flexibility and utility not only in the classroom but also on the playground, in the lunchroom, or other locations. That is, utilization of PRT can be centered around objects in the natural environment (e.g., household objects, toys), and it need not be administered in a rigid, artificial manner. The purpose of the present investigation was to assess (a) the degree to which a variation of PRT can be effectively implemented by typical peers to increase the social skills of both their low-functioning and moderate-functioning schoolmates with autism; (b) the generality of this method (e.g., across stimuli); (c) changes in collateral behaviors, such as language and attention; and (d) changes in the teacher's perceptions of social behavior after PRT.

METHOD

Participants

Bob was 10 years old, had received an independent diagnosis of autism from an agency not associated with this research, and was characterized by his teacher and family as socially unresponsive. For example, during free-play sessions, Bob consistently sat by himself in a corner bouncing a ball. Bob was a student in a nonintegrated special education classroom, and had an expressive vocabulary age equivalent of 3 years 5 months, as measured by the Expressive One-Word Picture Vocabulary Tests (EOWPVT; Gardner, 1990) and a receptive vocabulary age equivalent of 5 years 5 months, as measured by the Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 1981). Bob utilized three- to four-word sentences when directly prompted, but rarely initiated speech beyond its use to obtain preferred items (e.g., food, bathroom). Bob had a nonverbal IQ score of 60, as measured by

the Leiter International Performance Scale (Leiter, 1979).

Larry was 10 years old, had received a diagnosis of autism from an agency not affiliated with this research, and was also characterized by teacher and family as socially unresponsive. For example, he often engaged in repetitive actions (e.g., repeatedly placing and removing a pen in a bag) and disruptive behavior (e.g., having tantrums and wetting his pants). Larry attended the same special education class as Bob did and had an expressive language age equivalent of 3 years 2 months and receptive language age equivalent of 3 years 1 month, as measured by the EOWPVT and PPVT, respectively. Larry's language use was limited; he spoke mainly in one- or two-word sentences.

The peer trainers, Paul and Ryan, were also 10 years old and were selected by the teacher's recommendation of students who were cooperative and friendly.

Settings and Training Materials

Training took place in an infrequently used classroom at the participants' school. The generalization setting was a novel third-grade classroom where probes were taken when most students were at recess. Generalization peers were not trained in PRT strategies and were chosen randomly from a fourth-grade classroom. Training and generalization materials were toys with which two individuals could readily play (e.g., a ball, the Milton Bradley game Trouble®, Legos®, Fisher Price® garage, cars, and a toy oven).

Dependent Measures

Dyads were videotaped during 10-min play sessions before, during, and after PRT training for one or two sessions per day. The tapes were subsequently scored in 10-s intervals for the following social behaviors (definitions adapted from Kohler, Strain, Maretsky, & DeCesare, 1990).

1. *Maintains interactions.* Continued engagement in the same verbal or nonverbal activity as the peer. During intervals of peer initiations, positive responses (e.g., complying with a request or answering questions) were scored as maintaining interaction. For example, an interval in which the target child did not allow the peer to take his or her turn was not scored as maintaining interaction.

2. *Initiates conversation.* Verbalizations that were not in direct response to a preceding question or that occurred at least 5 s after a preceding verbalization. For example, saying "the ball is blue" or " I like pizza" was scored as initiating conversation.

3. *Initiates play.* Any verbal or nonverbal initiation of novel play or game. For example, handing the peer trainer a ball or saying "play blocks" (while engaged with a different toy) was scored as a play initiation.

Tapes were also scored to assess the following attention behaviors (definitions adapted from Lewy & Dawson, 1992).

1. *Nonengagement.* The child had no clear attentional focus (e.g., staring at the ceiling).

2. *Onlooking.* The child passively watched the activities of a play partner but did not maintain an interaction with that partner.

3. *Object engagement.* The child was actively engaged solely with a toy that he possessed (e.g., manipulated the toy with sustained visual attention).

4. *Supported joint attention.* The child was actively involved with a toy that the play partner manipulated to alter the child's experience with that object (e.g., target child laughed at the peer's action with the toy or reached for the toy) or actively watched the peer's activities while maintaining an interaction (e.g., watched the peer as he manipulated a car).

5. *Coordinated joint attention.* The child was actively involved with a person and a toy (e.g., the target child and peer engaged in the same activity with alternating periods of eye gaze to the peer).

To assess changes in language, tapes were scored in 30-s intervals for number of appropriate words spoken and sentence length (i.e., number of words per sentence). Finally, generalization measures were obtained with an un-

trained peer, novel stimuli, and a nontraining environment.

As a measure of external validity, the teacher of the target students completed the Walker–McConnel Scale of Social Competence (Walker & McConnel, 1988) at baseline, posttraining, and follow-up periods. This measure assesses various categories of social behaviors including teacher-preferred social behavior (e.g., responding to teacher's questions), peer-preferred social behavior (e.g., initiating play with classmates), and general school adjustment (e.g., having tantrums on the playground).

Interobserver Agreement

Interobserver agreement was calculated for 33% of sessions, across all experimental phases, for each behavior separately by measuring occurrences and nonoccurrences of the behavior. That is, the percentage of times the observers agreed that a behavior occurred or did not occur was calculated separately by dividing the number of times observers agreed a behavior occurred by the number of times they agreed plus disagreed for occurrences (vice versa for nonoccurrences) and multiplying by 100%.

Interobserver agreement was as follows (individual data are not presented because percentages were similar for both children's behaviors): For maintaining interaction, occurrence was 96% (range, 80% to 100%) and nonoccurrence was 98% (range, 92% to 100%). For initiations, occurrence was 86% (range, 64% to 100%) and nonoccurrence was 97% (range, 90% to 100%). For joint attention, occurrence was 90% (range, 78% to 100%) and nonoccurrence was 88% (range, 65% to 100%). Overall reliability for language frequency was 94% (range, 88% to 100%) and was 84% for sentence length (range, 72% to 98%).

Experimental Design and Conditions

A multiple baseline design across subjects was used.

Baseline. Various toys were placed in the middle of the room and the dyad (the child with autism and the peer) were told to "play together." No other instructions or prompts were given. Baseline probes were taken in the training setting, a generalization setting, with a generalization peer, and with generalization toys. Baseline probes lasted for approximately 2 months to control for increases in social behavior as a result of history and maturation.

Peer PRT training. Each peer was given a manual with each of the following PRT strategies represented in both pictorial and written form (manual available from authors upon request; for more detailed information on general PRT, see Koegel et al., 1989):

1. *Paying attention.* Ensure that the target child is attending before delivering a prompt or suggestion.
2. *Child's choice.* Give choices between different play activities to keep motivation high.
3. *Vary toys.* Vary toys frequently, according to the target child's preferences.
4. *Model appropriate social behavior.* Provide frequent and varied examples of appropriate play and social skills, including verbal statements (e.g., saying "this game is fun") and complex play actions (e.g., acting out a script with dolls).
5. *Reinforce attempts.* Verbally reinforce any attempt at social interaction or functional play (e.g., while playing catch, saying "great throw").
6. *Encourage conversation.* Withhold the desired play object until the target child emits a verbal response related to that object or activity (e.g., requiring the target child to say "let's play ball" before allowing him to have the ball).
7. *Extend conversation.* Ask questions or encourage conversation centered around tangible objects in the room (e.g., while playing with toy food say, "I like to eat ice cream, do you like to eat ice cream or pizza?").
8. *Turn taking.* Take turns during play to provide examples of appropriate play, promote sharing, and increase motivation.
9. *Narrate play.* Provide descriptions of play actions and scripts (e.g., while playing with the oven, say "I'm going to cook the pizza").
10. *Teach responsivity to multiple cues.* Com-

ment on object properties and require the target child to talk about object properties whenever possible (e.g., saying "do you want to play with the small, green ball or the big, blue ball?").

Strategies were first modeled and explained by the therapist. Next, peer trainers were instructed to explain each of the strategies to the therapist; this was followed by role playing with the therapist and finally role playing with the other peer trainer. This didactic phase of instruction lasted for 2 weeks and was comprised of four 30-min sessions (this phase of training is not described in the Results section, because the target child was not yet present). After the 2 hr of didactic instruction, peer trainers were paired with a child with autism for PRT training, during which feedback was given by the therapist intermittently during each 10-min play session. PRT sessions occurred after approximately 1 month of training and a minimum of 80% accurate implementation of strategies. During this phase, the therapist no longer provided feedback to the peer.

Posttreatment and Follow-Up

Posttreatment assessments were identical to those used at baseline and included generalization probes. A 2-month follow-up assessment was taken in the training setting only.

RESULTS

The percentage of intervals engaged in maintaining interactions and initiations is presented in Figure 1. During baseline, both Bob and Larry maintained interactions at low levels, and initiations were constant at 0% for Bob and near 0% for Larry (Figure 1). During the initial days of training, both children maintained interactions during a high percentage of intervals, but initiations remained relatively low. After several weeks of training, however, both children began to initiate both play and conversation with the peer and maintained these gains during a follow-up period. Bob's initiations consisted mainly of initiations of conversation (i.e., 87%) and some of play (13%), whereas Larry's initiations were more equally divided between initiations of conversation (46%) and play (54%). Finally, both children's social behavior generalized to novel stimuli (i.e., toys) and a novel setting. Bob's social initiations generalized to an untrained peer, initiations averaged 28% of the intervals, and maintained interactions averaged 46% of the intervals. Larry also initiated (i.e., twice) with his generalization peer but maintained few interactions.

Figure 2 shows the percentage occurrence of joint attention behaviors. During baseline, over 95% of Bob's attention behaviors were categorized as nonengagement or object based (i.e., the absence of joint attention), whereas after PRT training and during follow-up, Bob engaged in both supported and coordinated joint attention with the peer during the majority of play intervals. Larry also engaged in minimal joint attention behaviors at baseline and increased these behaviors slightly during PRT training; these behaviors increased more substantially after PRT training and during follow-up. Overall, Bob's joint attention behaviors consisted mostly of coordinated joint attention with few supported joint attention behaviors, whereas Larry's attention behavior was mostly supported joint attention with some coordinated joint attention.

Both children also showed changes in language use; these data are presented in Figure 3. During baseline, Bob did not speak and Larry spoke an average of less than one word per 30-s interval. During PRT training, however, Bob used some language, averaging almost four words per interval and used mostly one- or two-word phrases. After PRT training and during follow-up, Bob averaged approximately eight words per interval and spoke with mostly three-word sentences. Also, as indicated by the range bars, Bob occasionally spoke with greater frequency (e.g., 11 words per interval) and longer sentences (e.g., four-word sentences). Larry typically did not use much language in his daily life, as evidenced by his low levels at baseline.

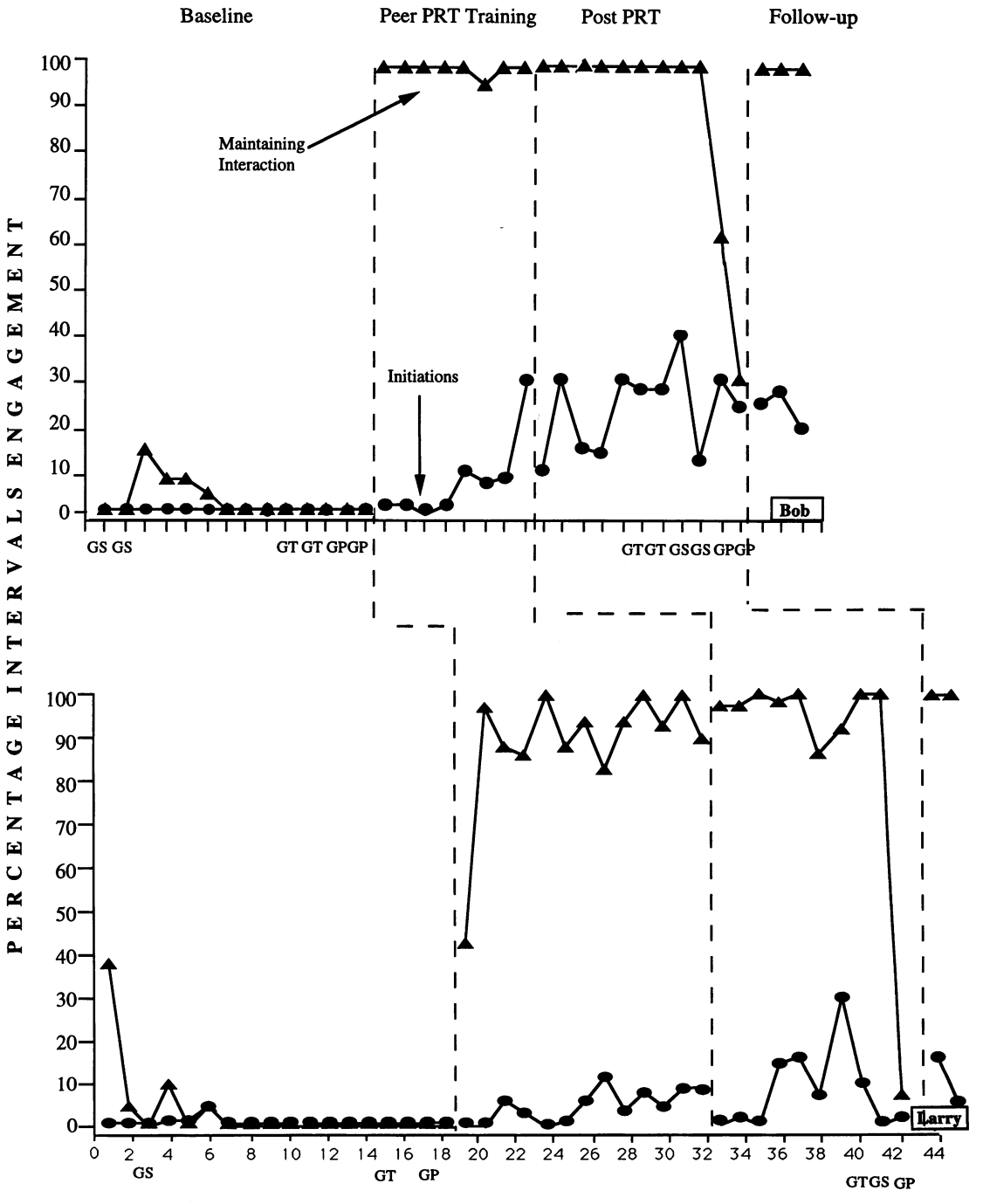

Figure 1. Percentage intervals of engagement in maintaining interactions and initiations of play and conversation during 10-min observations at baseline, PRT training, after PRT training, and at a 2-month follow-up. Play and conversation initiations were collapsed for clarity of presentation. See text for individual percentages. GS, GT, and GP represent probes taken in a generalization setting, with generalization toys, and with a generalization peer, respectively.

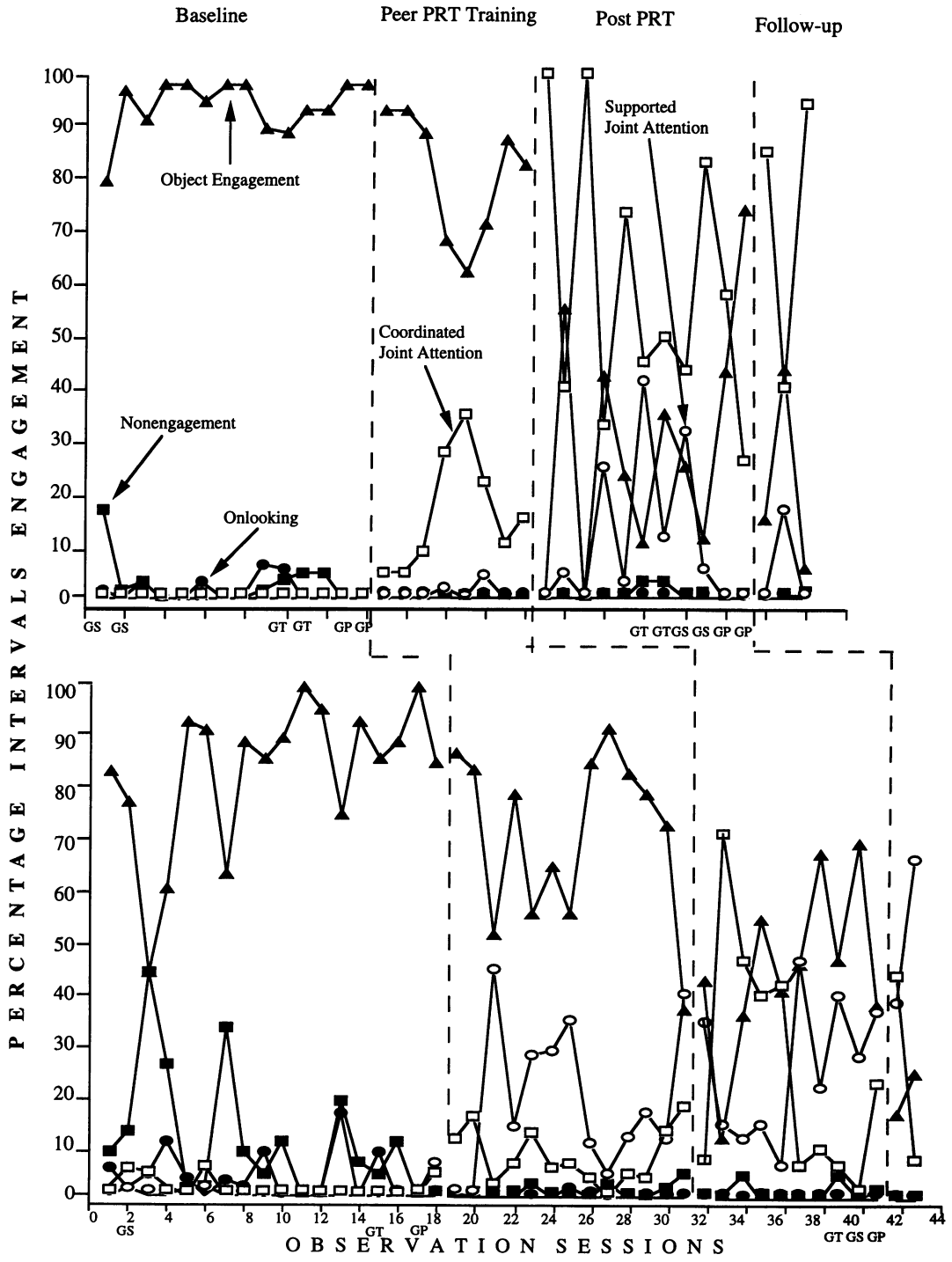

Figure 2. Percentage intervals of object engagement, nonengagement, onlooking, and supported and coordinated joint attention behaviors at baseline, PRT training, after PRT training, and at a 2-month follow-up.

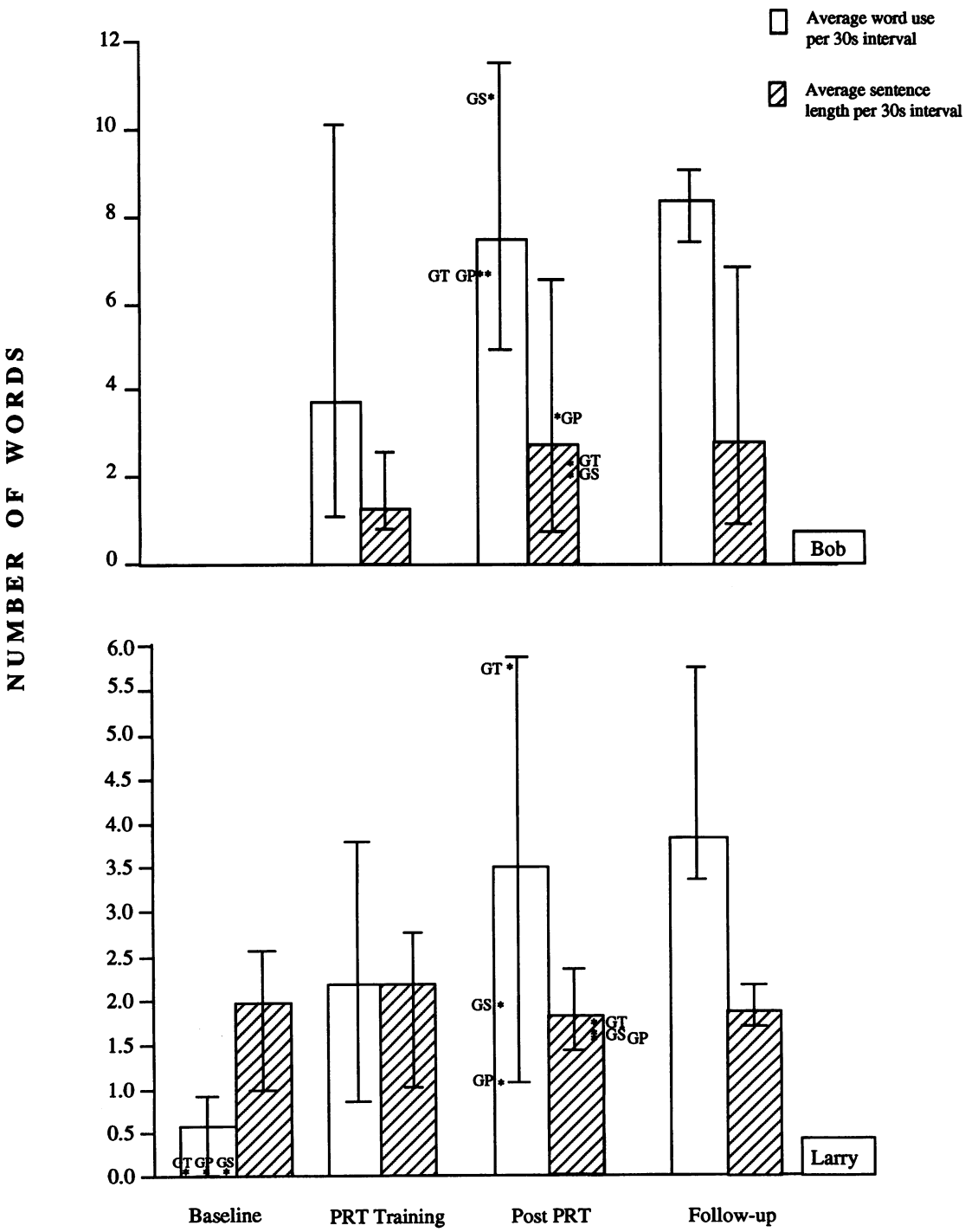

Figure 3. Average frequency of words spoken per 30-s interval and number of words per sentence during baseline, PRT training, after PRT training, and at a 2-month follow-up. T bars represent ranges of language use. GS, GT, and GP represent the average of probes taken in a generalization setting, with generalization toys, and with a generalization peer, respectively.

Table 1
Teacher Ratings of School Behavior as Indicated by Raw Scores on the Walker McConnel Scale of Social Competence and School Adjustment

	Teacher-preferred social behavior	Peer-preferred social behavior	School adjustment	Total
Bob				
Before	43	21	38	102
After	53	33	41	127
Follow-up	51	41	48	140
Larry				
Before	30	20	32	82
After	32	33	27	92
Follow-up	29	29	21	79

During training, however, Larry's word use increased to almost three words per interval and increased further at posttreatment and follow-up, averaging over four words per interval. Larry's sentence length did not change significantly and stayed constant at about two words per sentence throughout training.

The teacher's observations, as measured by the Walker–McConnel Scale of Social Competence, indicated increases in peer-preferred social behavior for both Bob and Larry as well as teacher-preferred social behavior for Bob. These changes were maintained during a follow-up period (see Table 1).

DISCUSSION

Results of this investigation suggest that PRT is effective in teaching complex social behaviors (i.e., initiations) and enhancing complex attention behaviors (i.e., joint attention) in children with autism. Importantly, this was accomplished in an appropriate social environment with typical peers as trainers. Both children's improvement in language use after training suggests that PRT was effective in increasing language skills, a finding that is consistent with prior research (e.g., Koegel et al., 1987; Laski et al., 1988). Larry's gains suggest that this procedure may be effective with children with limited verbal and cognitive abilities.

Peer-implemented PRT may have been effective in increasing the language and communication skills of the participants in this study for the following reasons: (a) Frequent and varied choice of activities may have functioned as an establishing operation (e.g., Michael, 1993), thereby increasing the reinforcement value of activities; (b) peers provided multiple exemplars for complex language; and (c) any reasonable attempts at communication were reinforced (i.e., communication attempts were almost always successful). Successful communications may thus have been reinforcing for both children, which may have led to increased levels of verbal initiations. Of note is the finding that both participants spoke often during the generalization toy condition, suggesting that peer-implemented PRT is effective in producing generalized responding.

An important finding of this study was evidence for response generalization. After training, both participants increased engagement in joint attention, a behavior not explicitly targeted. That is, both children's attentional focus switched from an object to a person or to other activities. These changes, however, were more substantial for Bob than for Larry. Bob engaged in high levels of coordinated joint attention, whereas Larry engaged mostly in supported joint attention.

Although peer trainers have been used frequently (e.g., Goldstein, Kaczmarek, Pennington, & Schafer, 1992; Odom et al., 1985; Sainato, Goldstein, & Strain, 1992), the peer trainers in the majority of these studies implemented only one or two strategies to increase the social skills of their schoolmates with autism, such as initiating play (Odom et al.) and using social reinforcement (Goldstein et al.). Findings of the present study are important because the peers learned a comprehensive treatment package over a relatively short period of time (i.e., approximately 2 months) and implemented it effectively with minimal adult supervision. In ad-

dition, the use of peer trainers produces minimal, if any, economic strain on the school budget and is a developmentally appropriate alternative to adult therapists. Furthermore, interviews with the peer trainers suggested that, although challenging, the play sessions with their schoolmates with autism were both rewarding and educational. For example, Paul commented after a few weeks of working with Bob, "today was great because it was the first day he talked to me without me asking him something first."

An interesting result was that Bob's social behavior generalized somewhat to an untrained peer and Larry's social behavior generalized poorly to the untrained peer. This limited generalization may have been due to the fact that the generalization peers had minimal, if any, interactions with children with disabilities prior to this study, and both were exceptionally timid around the participants. Bob initiated frequently with his generalization peer (i.e., 25% to 30%), but the peer rarely responded to these initiations. Perhaps an additional test of generalization to an unfamiliar peer who had been trained to use PRT would have better tested the generality of effects across individuals. Nonetheless, these findings suggest a need for additional measures to enhance generality. For example, the use of multiple peer trainers has been shown to promote generalization (McGee et al., 1992).

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Received March 17, 1994
Initial editorial decision June 1, 1994
Revisions received December 15, 1994; February 13, 1995; April 23, 1995; May 11, 1995
Final acceptance June 13, 1995
Action Editor, Anthony J. Cuvo