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THE TRAINING AND GENERALIZATION OF SOCIAL INTERACTION SKILLS WITH AUTISTIC YOUTH

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Two experiments were conducted to increase the initiations and duration of social interactions between autistic and nonhandicapped youths. Experiment 1 taught two autistic youths to initiate and elaborate social interactions with three age-appropriate and commonly used leisure objects; a radio, a video game, and gum. The students were first taught to use the objects and subsequently instructed in the related social skills. The youths generalized these social responses to other nonhandicapped peers in the same leisure setting. A second experiment trained a third autistic youth to emit similar social leisure skills. The use of the leisure objects and the related social skills were taught at the same time. The autistic youth learned these skills and generalized them to other handicapped peers in the same leisure setting. The importance of teaching generalized social responding in particular subenvironments was emphasized.

DESCRIPTORS: social skills, autistic youths

The term autism denotes a withdrawal from social interaction with other persons. Individuals diagnosed as autistic display an array of behavioral pathologies such as self-injury, overselective attention, and self-stimulation that theoretically are manifestations of the underlying condition of extreme self-directedness. The thrust of past educational and research efforts has been to develop interventions that remediate the behavioral excesses and skill deficits so common among autistic persons. An initial tactic has been to reduce aberrant behavior—like aggression and self-stimulation—through behavior management procedures (Koegel & Covert, 1972). With deviant behavior under control, interventions have been applied to remediate language deficits (Lovaas, 1977) and to teach a number of skills in the areas of self-care, perceptual development (Schreibman, Koegel, & Craig, 1977), and vocational education (Bellamy, Horner, & Inman, 1979).

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Interestingly, there has been relatively little research that directly investigates the social development of autistic persons. This is ironic because the central defining feature of autism is extreme social withdrawal. Previous work related to social development includes a study by Koegel and Rincover (1974) which taught autistic children to function effectively in a group of autistic students. Initially, the students were only capable of working in an individualized (one-to-one) instructional context. Egel, Richman, and Koegel (1981) demonstrated that autistic students can imitate their nonhandicapped peers in order to learn a number of tasks. In a study more directly related to social interaction, Strain, Kerr, and Ragland (1979) showed that peers can be trained to induce autistic students to interact with them in a free play setting. There is a larger research literature dealing with social skill training which has been primarily carried out with mentally retarded and behavior disordered children (cf. Strain & Fox, 1981). In these studies a normal peer was trained how to prompt and reinforce the behavior of a socially withdrawn child. The studies were successful in that the normal peer became an effective instructor and the withdrawn child learned to emit a number of social play behaviors.

The bulk of past work on social training has

taken place with preschool children (Guralnick, 1978). There are substantive and practical reasons for this development. Most importantly, the differences in social and cognitive abilities between handicapped and nonhandicapped preschoolers are proportionately less than their counterparts at the elementary and secondary school levels. In addition, university researchers have found easy access to laboratory preschools. Consequently, few procedures have been developed to teach social skills to older handicapped students. In this study, we examine social skill development between adolescent autistic and nonhandicapped students in a high school setting.

The prevailing tactic of past efforts has been to train a nonhandicapped peer to be the primary agent of social behavior change (Strain & Fox, 1981). A complementary strategy taken in our study is to directly train autistic students to initiate and elaborate interactions with their nonhandicapped peers. A complete social exchange can be broken down into initiation, elaboration, and termination phases. Of these three components, the initiation phase has been the most thoroughly analyzed (Haring, 1978; Stokes, Baer, & Jackson, 1974). Unfortunately, the training of initiation responses such as "Hi" and gestural waves tends to result in exchanges lasting for only a few seconds. Training packages that focus on the elaboration phase need to be developed to promote longer duration exchanges. Most elaborations among normal persons tend to be conversational in nature. Because autistic persons characteristically have limited language repertoires, there is an inherent problem in relying on verbal discourse for elaborated encounters. Therefore, we selected nonverbal activities that could be used as a means to promote elaborated social encounters. The activities were of a social leisure variety. They were selected so that they would be reinforcing to both the autistic and the nonhandicapped student. The judicious selection of play materials has been shown to be an important precursor to cooperative or isolate play (Hendrickson, Strain, Tremblay, & Shores, 1981; Quilitch & Risley, 1973).

The few studies using autistic students have been successful in training the acquisition of social skills in a specific setting (Ragland, Kerr, & Strain, 1978; Strain et al., 1979). These same studies were unsuccessful in promoting the generalization of social responses to different settings and persons. In explaining the appearance of generalized social responding in other populations, Strain, Shores, and Timm (1977) pointed to the importance of imitation skills, verbal abilities, and the presence of effective reinforcers in the target environment. The absence of these properties may preclude the generalization of social skills by autistic persons. In this study, we used a "simultaneous" training procedure (Stokes & Baer, 1977) to promote generalization. Most social skill training studies in the past have used the dyadic model of exposing one withdrawn child to one normal peer. We simultaneously trained the autistic student with multiple exemplars (peers), to foster social initiations and elaborations with other students.

EXPERIMENT 1

Method

Participants

Two youths attending a class for autistic and severely handicapped students participated in the experiment. Both participants were diagnosed as autistic by an independent agency.

Mike was a 20-year-old, characterized as socially withdrawn. During the previous 2 years he averaged five aggressive acts per year involving striking himself and others. He engaged in a high rate of self-stimulatory and inappropriate behaviors, which included humming, singing, facial grimacing, head jerking, patting women on the face and buttocks, hitting his finger tips against flat surfaces, and stealing food and other objects. Mike had an expressive vocabulary of about 100 words. He could appropriately request food items, the use of the bathroom, and the desire to play tennis. Typically, however, he would state words out of context in a self-stimulatory manner. He could follow 2- and 3-step commands.

Mike was capable of performing a number of

functional tasks for periods ranging from 15 to 30 min. He successfully held a work study job at his high school which required him to wash dishes and bus tables. He independently performed all basic self-care behaviors like toileting and dressing.

His social withdrawal consisted of several behavioral patterns. He rarely initiated verbal or nonverbal social interactions. He would respond "hi" to the greetings of others but he did not display spontaneous greeting behaviors. When he was approached by peers, he avoided eye contact and maintained a considerable distance from the other person. He engaged in leisure activities with others only when prompted to do so.

Mike functioned at the severely mentally retarded level of intelligence. Estimates made by psychologists of his IQ placed him in the 35–45 range.

Dan was a 17-year-old who displayed a number of aberrant behaviors, which included hand-biting, breaking objects, hitting peers and staff, and loud vocalizations. He appropriately requested food, records, and trips to stores. Dan was capable of a wide variety of independent tasks, including self-care skills, riding public transit, cooking simple meals, and cleaning the teachers' lounge.

Dan ignored other students. During his free time with peers, Dan typically ran through the crowd of people until he found an open area. He would then jump up and down and loudly vocalize to himself. He would respond "hi" to the greetings of staff members but would not spontaneously greet anyone. He occasionally (three times per week) initiated physical contact with staff members by tickling them, scratching their backs, or touching their hands.

Dan functioned at the severe to moderate level of mental retardation. Psychometric evaluations indicated IQ scores that ranged between 30 and 55.

Setting

The investigation was conducted at a large suburban high school. A series of probe conditions was designed to observe the acquisition and generalization of social skills in a school setting.

Probe setting. Generalization probes were conducted in an outdoor courtyard (15 × 25 m). Adjoining the special education classroom were three regular education classes. The courtyard contained four benches which were placed around a central planter. During regularly scheduled break times, 8 handicapped and approximately 35 nonhandicapped students would gather in the courtyard.

The break time was unstructured for both groups of students. The nonhandicapped students in the courtyard represented a typical cross section of the students attending the high school. Freshman, sophomores, juniors, and seniors were present in equal proportions. Typically, the nonhandicapped students would spend their break time by "hanging out," e.g., stand in small groups, converse, and smoke cigarettes.

The autistic students had been attending classes at the high school for 2 years prior to the study. The nonhandicapped students tended to pay little attention to the self-stimulatory behavior or the social isolation behavior of the autistic students. If an autistic student did approach a group of nonhandicapped students, he or she was often greeted and welcomed into the group. Instances of ridicule or abuse were rare. Since the autistic and nonhandicapped students had been on the same campus for several years, some nonhandicapped students had learned the names of the autistic students and would greet them. Other nonhandicapped students in the setting had previously served as peer tutors in the autistic classroom. Thus, the composition of students who took their breaks in the courtyard consisted of those who had no previous experience interacting with autistic students (unfamiliar peers) as well as those who either had served as peer tutors or had made an effort to interact with the autistic students on their own (familiar peers). The nonhandicapped students were not informed of the experimental conditions and were not aware of the purpose of the data collection. The peer tutors in the break time setting were not involved in social skill training at any time.

Two generalization probe times were used, corresponding to two scheduled morning breaks. The generalization probes lasted for 15 min. A break lasting from 10:05 to 10:20 a.m. (time 1) was used from Tuesday to Friday for all phases of the

study. Another break (time 2, 11:00 to 11:15 a.m.) was added during the social skill training phases. One or two observers stood in the courtyard to record data; they held a stopwatch and had a pen concealed in the front pocket of a sweatshirt. Because of the large number of persons present in the courtyard during probe times the observers were able to remain unobtrusive and unnoticed.

Training settings. Training was conducted both in the generalization setting and the special education classroom. Training in the generalization setting occurred at different times from the morning break times. When training sessions occurred in the generalization setting, no nonhandicapped peers were present other than the peer trainers.

The special education classroom was 6 × 8 m in size and contained a free time break area (2 × 3 m) where training sessions also took place. The break area had a sofa, rug, phonograph, and a bookshelf containing a variety of games, magazines, and records. The number of training sessions was evenly divided between the classroom setting and the courtyard setting.

Conditions

The participants were exposed to a sequence of five experimental conditions. The sequence of conditions was designed to layer in three components of extended social interactions in addition to providing a natural baseline condition.

For each of the conditions, generalization probes were run in the courtyard to evaluate the effect of the treatment. The condition probes occurred on the same days in which training occurred. The two baseline probes involved no training at another time of the day. Rather, the student was probed with or without possession of the leisure objects. The three training probes all had the student carry an object. The type of object carried was randomly varied from session to session. After the initial no-object baseline condition, no-object probes were intermittently run through the remainder of the experiment.

No-object baseline. The participants were first exposed to a baseline condition in which they circulated throughout the courtyard during the morning break. The participants carried no special objects and were given no instructions during the probes. Measures began when the participating special education teacher gave the cue "take a break" and the participants entered the courtyard.

Object-only condition. The participants were sent to the courtyard for the break time probe with one of three objects and the same instructions to go take a break. The objects were selected because of their potential reinforcement value during interactions between autistic and nonhandicapped students. The students were given no instructions on how to operate the objects or how to socially interact with them. The condition served as an evaluation of the mere presence of attractive objects on social interaction.

The first object was a hand-held, video game called Pacman. Video games were popular among nonhandicapped students in this high school setting. The game could be learned by autistic persons, and because the hand-held version is portable, it could be used in a variety of break time settings. The second object was a Sony Walkman FM radio equipped with a pair of stereo headphones. Many teenagers wore the headphones for listening to popular music both on and off the high school campus. The third object was a pack of chewing gum. Gum was selected because it was noted that it was often used in the midst of a conversation to reinforce the other person and further established the intimacy of the interaction. Thus, the gum was portable and served as a potential reinforcer for the nonhandicapped student during the interaction. The objects required little or no verbal discourse during an interaction and were thus suited to the communicative abilities characteristic of the autistic population.

Object function training. The object function training condition taught the participants to manipulate the object successfully. The participant was again sent out for the generalization probe with a particular object and the instructions to go and take a break. At another time of the day, though, he received one or two training sessions in the appropriate use of the object. The trainer met individually with the student and taught him how

Table 1
Task Analyses for Object Training

Pacman
1. Turn on machine.
2. Press start.
3. Make Pacman move down.
4. Change direction at wall.
5. Run away from ghost.
6. Read score.
7. Turn game off.
Walkman
1. Turn on radio.
2. Adjust volume control to level 6.
3. Put headphones on.
4. Select rock station.
5. Change station at the beginning or end of a song.
6. Change station at a commercial.
7. Turn off radio and remove headphones.
Gum
1. Take stick of gum out of pocket.
2. Unwrap gum.
3. Put gum in mouth.
4. Chew for 15 s without swallowing. Successively increase time criterion to: 30 s, 1 min, and 3 min.
5. Throw gum away into a receptacle.

to play Pacman, tune in and operate the Walkman radio, and open and chew one piece of gum at a time without swallowing it when finished. The sessions consisted of five consecutive trials. The behavioral steps for performing each object activity were task analyzed and appear in Table 1. The use of the object was taught as an isolated task and no related social skills were part of the task analysis. Each task was taught with a concurrent or total task training procedure (cf. Bellamy et al., 1979; Gaylord-Ross, 1981). The trainer prompted to "play Pacman," "listen to the radio," or "chew the gum." The student was expected to complete all the behaviors in the task analysis in their proper sequence. Correct responses were positively reinforced with verbal praise. When there were five consecutive correct responses of a behavioral step, contingent reinforcement was dropped for that step. An error consisted of no response, a partial response, an incorrect response, or a response out of sequence. Errors led to the immediate verbal and physical prompting of the correct response. Prompted responses were not reinforced.

Training sessions began with one object. When the student reached 80% performance on one object, a second object was included during training sessions. The training trials then alternated between the two objects. Criterion was reached when the student attained three consecutive trials with no errors. The object was then no longer included in the training sessions. Mike was sequentially trained in Walkman, Pacman, and gum. Dan's order of training was Pacman, Walkman, and gum. The purpose of the object training condition was to investigate the effects of acquiring competence at manipulating an object on subsequent social interactions.

Social skill training. After the student had learned to manipulate the object appropriately, a social skill training condition was established to teach the social skills that would permit the autistic person to initiate and engage in social interactions with these objects with his nonhandicapped peers. Social exchanges may be analyzed into initiation, elaboration, and termination phases. This training condition first taught the autistic student to approach a peer and make a greeting response. Next, the student offered to play with the object with his peer. If the peer responded affirmatively, they engaged the object in a reciprocal fashion. Finally, a termination or farewell response was made to signal the end of the interaction.

Table 2 presents the task analyses of the three social skill training programs. The students received one or two training sessions per day. The sessions lasted about 5 min. Sessions were scheduled at least 15 min prior to conducting generalization probe measures. Six trials were run in each session. However, the first trial in each session was conducted as a "retention" probe. That is, no prompts, corrections, or praise were given on the first trial. All training trials began with the cue to "take a break." After the initial cue was presented the student had to produce each response in the chain accurately. Correct responses were verbally reinforced and errors were verbally and physically prompted to produce responses in the correct sequence. The criterion for acquisition of the social responses was 100% correct for two consecutive sessions.

Table 2
Task Analyses for Social Skills Training

Pacman

1. AS approaches NS.[a]
2. AS establishes 1-m proximity.
3. AS establishes a face-forward orientation.
4. AS says "hi."
5. AS waits for response.
6. AS says "want to play?"
7. AS waits for response. AS finds someone else if NS does not indicate willingness to play. AS then begins sequence at step 1 again.
8. AS turns game on.
9. AS hands game to NS.
10. AS watches NS play.
11. AS receives game from NS.
12. AS reads NS score.
13. AS turns game off.
14. AS turns game on the reset score to zero.
15. AS plays game (see steps for playing Pacman in Table 1).
16. AS reads own score.
17. AS offers game to NS. If NS accepts, play continues in alternating fashion. When NS indicates he or she is finished, AS takes game back.
18. AS says "bye."

Walkman

1. AS approaches NS.
2. AS establishes 1-m proximity.
3. AS establishes face forward orientation with NS.
4. AS says "hi."
5. AS waits for response.
6. AS says (and writes)[b] "wants to listen."
7. AS shows radio to NS. If NS not interested in interacting, AS approaches another student (step 1).
8. AS turns on radio.
9. AS adjusts volume to level 6.
10. AS hands headphones to NS.
11. AS puts on headphones.
12. AS selects rock and roll station.
13. AS remains in proximity to NS until termination of interaction by NS.
14. AS says "bye."

Gum

1. AS approaches NS.
2. AS establishes 1-m proximity.
3. AS establishes a face-forward orientation.
4. AS says "hi" to NS.
5. AS waits for a response.
6. AS says (and writes)[b] "what are you doing?"
7. AS waits for a response.
8. AS says (and writes)[b] "want some gum?" and shows pack of gum.
9. If NS says yes, AS hands pack of gum of NS.
10. NS hands pack back to AS.
11. AS selects stick of gum and chews it until the end of the interaction.
12. AS remains in 1-m proximity to NS for at least 30 s or until end of interaction.
13. AS says "bye" when NS terminates the interaction.

Galaxian

1. AS approaches NS.
2. AS establishes 1-m proximity.
3. AS establishes face-forward orientation to NS.
4. AS says "hi."
5. AS waits for a response.
6. AS writes and says "want to play?"
7. AS shows message and game to NS.
8. If NS indicates no, AS goes to another student (step 1).
9. AS turns on game.
10. AS hands game to NS.
11. AS looks at game for 10 out of every 15 s NS is playing.
12. AS receives game from NS.
13. AS says NS score.
14. AS turns game off.
15. AS turns game on.
16. AS depresses right directional dial with right hand.
17. AS repeatedly depresses fire button with left hand.
18. AS depresses left directional dial with right hand.
19. AS reads own score at end of game.
20. AS offers game to NS. Steps 11–20 continue if NS indicates interest in playing.
21. AS says "bye" when NS ends interaction.

[a] AS = autistic student, NS = nonhandicapped student.
[b] Applies only to Jim, who would write on a notebook the words he was saying and display the notebook to the NS.

In the training sessions, the social interactions were prompted between the autistic student and a nonhandicapped peer. The trainer was present to prompt and reinforce the exchanges. The peers used in training were selected on the basis of a conceptual model to promote stimulus generalization. The CASE model developed by Horner (Horner, Sprague, & Wilcox, 1982) uses a simultaneous training strategy (Stokes & Baer, 1977) to promote generalization. The student is exposed to multiple exemplars of a stimulus (in this case, nonhandicapped, adolescent peers). The training exemplars should contain the range of critical attributes present in the stimulus conditions where generalization is to take place. In this case, the training peers were in the 10th, 11th, or 12th grade (age variation). They were either known or unfamiliar to the autistic student (variation across the familiarity dimension). The participant was exposed to six peer trainers (two male and four female) who were rotated across the social skill training sessions. The peer trainers were never present during generalization probes. During a given session only one peer tutor was used.

Before the first training session the peer was presented with a verbal and written description of the training procedure. The peer was shown a script

Table 3
Training Scripts for Nonhandicapped Peer and Autistic Student

Autistic student[a]	Nonhandicapped peer[b]
Pacman	
1. "Hi."	
	2. "Hi, _____, how are you doing?"
3. "Fine."	
4. "Want to play Pacman?"	
	5a. "Sure (yeah, great)" or b. "No, thanks."
6. Turns on game.	
7. Hands game to NP.	
	8. Plays game until it is over.
	9. Hands game to AS.
10. Reads score.	
11. Turns game off and then on and plays.	
	12. Watches while AS plays; encourages him when AS plays well.
13. Reads his own score at the end of the game.	
14. Offers game to NP.	15. Plays game or says "No, thanks, got to go, bye."
16. Says "bye."	
Walkman	
1. "Hi."	
	2. "Hi, how are you?"
3. "Fine."	
4. "Want to listen?"	
	5a. "Sure" or b. "No, thanks."
6. Turns on Walkman.	
7. Sets volume to 6.	
8. Hands headphones to NP.	
	9. Puts on headphones.
10. Turns to rock 'n roll station.	
	11. Listens or tells students to change station and then listens.
	12. Gives headphones back to AS and says "bye."
12. "Bye."	
Gum	
1. "Hi."	
	2. "Hi."
3. "What are you doing?"	
	4. "Just setting around, (not much, waiting for someone)."
5. "Want some gum?"	
	6. "Sure (yeah)."
7. Hands stick to NP.	
	8. Takes stick of gum and says "thanks."
9. "Sure."	
10. Chews gum.	
	11. Talks to student. Asks him "What did you do yesterday? What are you doing after school?"
12. Responds to questions from NP.	
	13. Hangs out for 1–3 min.
	14. "Bye."
15. "Bye."	

[a] AS = autistic student.
[b] NP = nonhandicapped peer.

of how he or she was to respond to the social behaviors of the autistic student (see Table 3). The trainer and the peer role played the exchange prior to the first training session. The trainer thereafter monitored peer and autistic student behavior. Peers learned their scripts fairly easily and there was no need for extra training.

Maintenance. Four months after training conditions were terminated the participants were again handed an object and given the cue to take a break. As during the object-only baseline, the participants were given no instruction or prompts on how to operate these objects or how to interact with the nonhandicapped students. In other words, aside from the passage of 4 months without any training, the maintenance probes did not differ from the generalization probes.

Measurement

During the 15-min probe period an observer recorded a number of social behaviors. The observer was familiar to the regular and special education students in the courtyard. The observer

stood at least 5 m away from the participants during the probe sessions. Mike and Dan were observed simultaneously. Only social events enacted between the participants and the nonhandicapped peers were recorded. Three classes of dependent variables were recorded during the generalization probes.

Social initiation. A social initiation was defined as one student approaching within 1 m of another student, orienting his or her body toward the other person and making a verbal or gestural response to indicate purposeful communication, e.g., exchanging an object, conversing, or touching one another. Initiation behaviors that did not lead to an acknowledgment from the other person were not scored as social initiations because a response without some acknowledgment by another person cannot be considered a social behavior. Acknowledgment behaviors included verbal replies, gestural replies, handling objects, changes in head or body orientation, or making eye contact with the social initiator. Behaviors that appeared to be self-stimulatory or noncommunicative were not scored as social initiations. Social initiations were coded as either "autistic student initiations" or "nonhandicapped student initiations." The total number of autistic and nonhandicapped student initiations were separately tallied for each participant at the end of the probe session to produce four frequency scores.

Duration. Whenever an interaction was initiated, the observer started a stopwatch. The stopwatch was turned off at the end of the interaction. An interaction ended whenever the targeted participant or the nonhandicapped student shifted attention to another person or moved 1.5 m away from the interacting student. The observer carried two stopwatches in case the participants were having simultaneous interactions; although this never happened. At the end of the interaction the observer recorded the duration and type of social initiation that had occurred. The number of seconds of interaction was summed at the end of a session to produce a duration score for each participant.

Descriptive information. A variety of descriptive information was recorded in addition to the initiation and duration data. Whenever an interaction occurred, the observer recorded the name of the nonhandicapped peer who took part in the social exchange. The nonhandicapped peer was categorized as a peer tutor (however, not a peer used during social training), a familiar peer, or a nonfamiliar peer. The observer also noted whether the interaction was centered around any object. Object-centered interactions were defined as social events that involved the offering and exchange of the video game, Walkman, or gum. Nonobject-centered interactions were defined as social interactions involving verbal exchanges of information, requests for food, or other responses not directly trained within the study.

Reliability. A second observer checked reliability in the generalization probe setting. Four individuals who were graduate students in special education served as reliability observers. The observers were trained to use the instrument by scoring social behaviors in a similar break time setting prior to the study. The second observer stood unobtrusively in the courtyard at least 5 m away from the primary observer. There were two to four checks in each probe condition. At a minimum, reliability probe sessions were scheduled immediately before and after changes were made in the experimental conditions. Agreement was evaluated on a point-by-point basis (Kazdin, 1982, p. 54). That is, the agreement or disagreement concerning the occurrence of a social behavior was determined for every discrete social event. For example, when observer 1 saw Dan wave hello to a specific nonhandicapped peer at 2 min, 3 s into the session and observer 2 recorded the same event at that time, that was an agreement. If observer 1 recorded that event at that time but observer 2 did not, that was a disagreement.

The reliability of the duration data collected during the generalization probes was calculated with the smaller/larger formula described by Kazdin (1982, p. 52). The percent agreement was calculated for each instance of a social event. For instance, if observer 1 saw Dan wave to a specific peer at a given time for 10 s and the second observer recorded the duration of that event to be 5

Table 4
Interobserver Agreement for Training and Generalization Sessions

	Student	Number of checks	Range (%)	Median (%)	Mean (%)
Frequency of interaction (generalization)	Dan	15	50–100	100	93
	Mike	17	50–100	100	97
Duration of interaction (generalization)	Dan	15	61–100	98	94
	Mike	17	35–100	85	84
Behavioral steps (training)	Dan	10	100	100	100
	Mike	12	100	100	100

s, the event agreement would be 50%. Then, the mean of the percent agreements of events across a session was calculated. Events in which both observers did not agree on their occurrence were not included in these calculations. Summary data are reported in Table 4. Reliability coefficients were obtained in 34% of the generalization probes for Mike and in 39% of the generalization probe sessions for Dan.

The reliability of the training data was assessed with nine reliability checks for each participant. The method and formula for evaluating the reliability of the training data were the same as those used to evaluate the frequency of interaction data collected during the generalization probes. The percent agreement coefficients attained during the training sessions appear in Table 4.

Design

A multiple-baseline design across stimuli was used to demonstrate the functional control of the social skill training package over the participant's acquisition of the approach, initiation, exchange, and termination responses. Baseline probes, conducted within the training setting, were taken across all three objects. The trainer handed the participant the object and gave the cue to take a break. The nonhandicapped teenager, pretrained with the script from Table 4, was seated in the courtyard reading a magazine. The trainer recorded the number of responses from the task analysis (Table 3) for the particular object that the autistic student displayed. On entering the courtyard setting the trainer watched from a distance of 8 m and recorded all correct responses whether in sequence or not. The trainer offered no prompts or reinforcers during baseline. After a sufficient number of baseline sessions indicated that few of the social behaviors were spontaneously produced by the participant, social skill training with each of the three objects was implemented sequentially. Performance was measured by tallying the number of correct responses in each trial as per baseline measures.

The generalization probes were conducted sequentially as training proceded with successive objects. First, a series of no-object baselines were run. Again, at later phases of the experiment, no-object probes were intermittently presented to evaluate whether social responding would occur in the autistic youth without possessing the trained object. After the initial no-object baseline, a series of object baseline probes was run to evaluate the effect of possessing the object without knowing how to use it. Next, object probes were run after object function training began. Finally, following social skills training, object probes at times 1 and 2 were alternated across sessions. There was some overlap between object baseline probes and object function probes for the following reason: When object function training began with Pacman, for instance, subsequent probes with Pacman were labeled object function but gum and Walkman were still in the object-only baseline because no training had begun with these objects. Subsequently, when object function training began with Walkman, probes with Walkman (and Pacman) were labeled object function whereas yet-to-be-trained gum probes were still object-only baseline. Finally, gum was trained

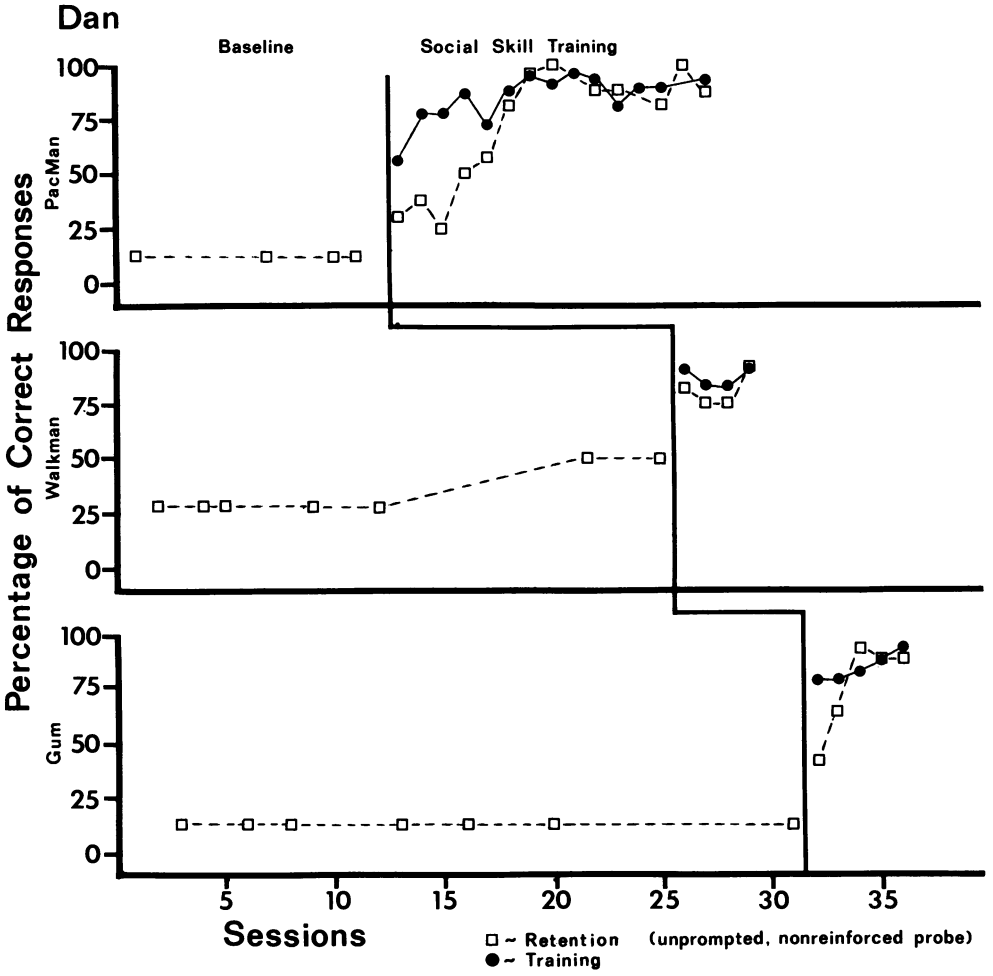

Figure 1. Percentage of responses completed in the task analyses of social interaction behaviors for Dan.

and all probes were object function. The same overlapping of object function and social skill probes occurred when the objects were sequentially added during social skill training.

Results

The effectiveness of the social skill training package is demonstrated in Figure 1. The percentage of correct responses for Dan in the social skill analyses for the retention probe trials is plotted in the baseline and training conditions. The profile of Mike's acquisition of the social behaviors across the three objects was nearly identical to Dan's but is not graphically displayed here. Both Dan and Mike displayed steady baseline levels of performance that ranged between 5% and 50%. This nonzero level reflects the skills that they had already learned in manipulating the objects in the object training condition. In baseline there was still an absence of the social skills enumerated in the task analyses. When social skill training was introduced there was an immediate and substantial increase in performance in the retention trials across all three objects for both students. Figure 1 shows how training and retention trial performance stabilized at the 80%–100% level.

An analysis was made of the generalization of social skills during the unstructured breaktime.

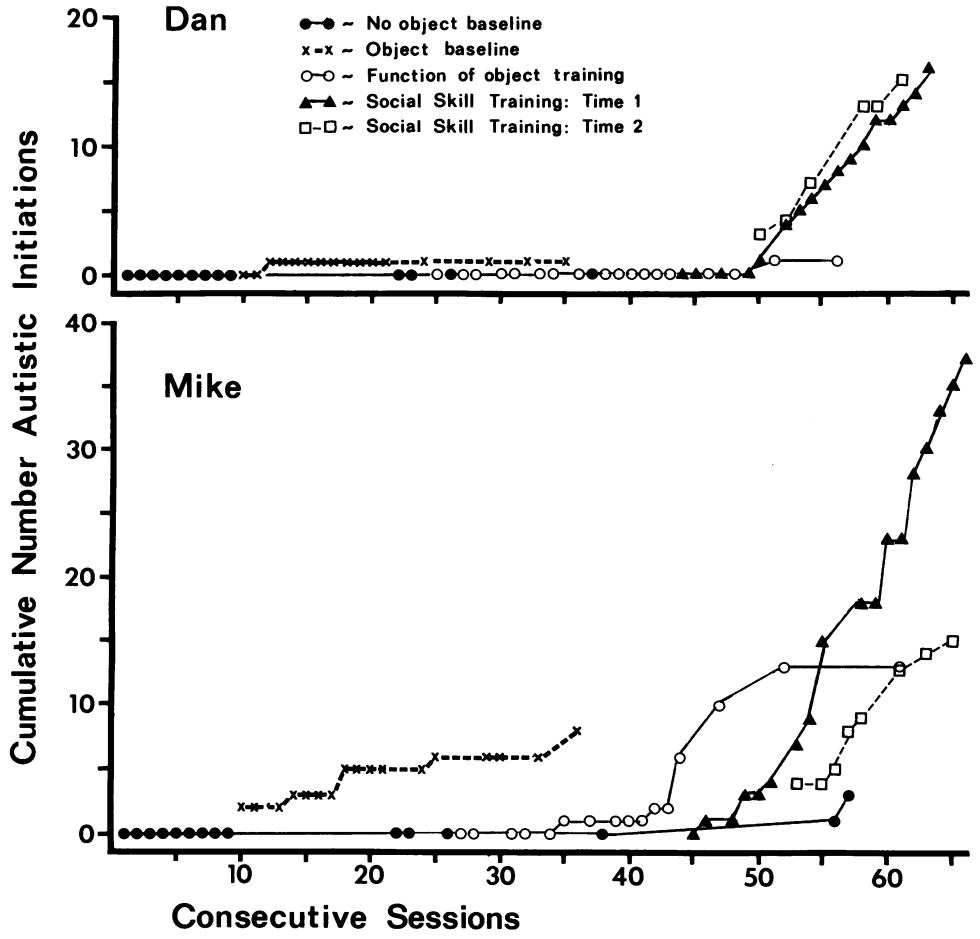

Figure 2. Cumulative numbers of social initiations for Dan and Mike in the four probe conditions.

Figure 2 presents the cumulative number of autistic-initiated (AI) responses by Dan across generalization probe sessions. Baseline (no-object) probes produced no responses throughout the study. The 16 sessions of the object-alone condition produced only one self-initiated response. Similarly, during the 18 probes of object training only one initiation response was observed. Next, the social skills training did produce a substantial amount of generalized responding. There was a total of 16 responses in 17 sessions. In the last condition of the experiment, it was decided to run additional generalization probes at a second break time. The six "time 2" probes (vs. the 10 a.m., "time 1" probes) resulted in 15 responses across six sessions. Therefore, the rate of responding in time 2 probes was about three responses per session, which exceeded the time 1 rate by threefold.

The generalization of AI responses for Mike also appears in Figure 2. Again, there was no responding during initial baseline sessions. Interestingly, generalized responding did occur in the first two no-object probes that were taken later during the social skill training phase. Thus, when Mike learned social approach, elaboration and termination behaviors with objects, he generalized them to circumstances when he carried no objects. In contrast to Dan, Mike did emit some AI behaviors in the object-only baseline and object training conditions. The rate of responding was low, though; four re-

sponses per session in the object-only baseline condition and eight responses per session in object training. The social skills (time 1) training probes showed a substantial amount of AI responding (two initiations per session). The time 2 probes also produced a rate of two initiations per session. Like Dan, a substantial rate of generalized responding occurred only after Mike had attained criterion in the social skills training sessions.

A further analysis was conducted on the duration of AI interactions and the type of object used in these occurrences. Figure 3 shows that the only substantial duration of responding (in cumulative number of seconds) for Dan was with the Pacman and Walkman objects. All these probe sessions occurred during social skill training except for one object training probe with Walkman. The duration of the generalized responding that occurred with gum was shorter in comparison.

Dan's data included all AI interactions that were centered around the interactive object and all that were not. In Dan's case, almost all interactions were object-centered so that the graphs for all AI interactions (Figure 3) versus object-centered-only interactions would be nearly identical. In contrast, Mike's interactions differed between the total AI interactions and those initiated only around the trained object. Figure 4 shows that for Mike, in the Walkman probes, substantial social initiation did not occur until social skill training was begun. However, only about half of the total AI interactions were centered around the object. This is consistent with Mike's AI data in the no-object, baseline probes of social skill training (see Figure 3). There, AI responses appeared in the absence of the trained objects. Similarly, the data from Pacman show that none of the AI interactions were centered around the object. Yet, the other social behaviors trained, like approaching, posturing, and greeting appeared in the generalization probes. The gum object produced consistent but short duration interactions that were object-centered.

Interactions initiated by the autistic students were analyzed. We found that throughout the study, Dan initiated interactions with peer tutors 20 times; familiar, nonpeer tutors 19 times; and unfamiliar

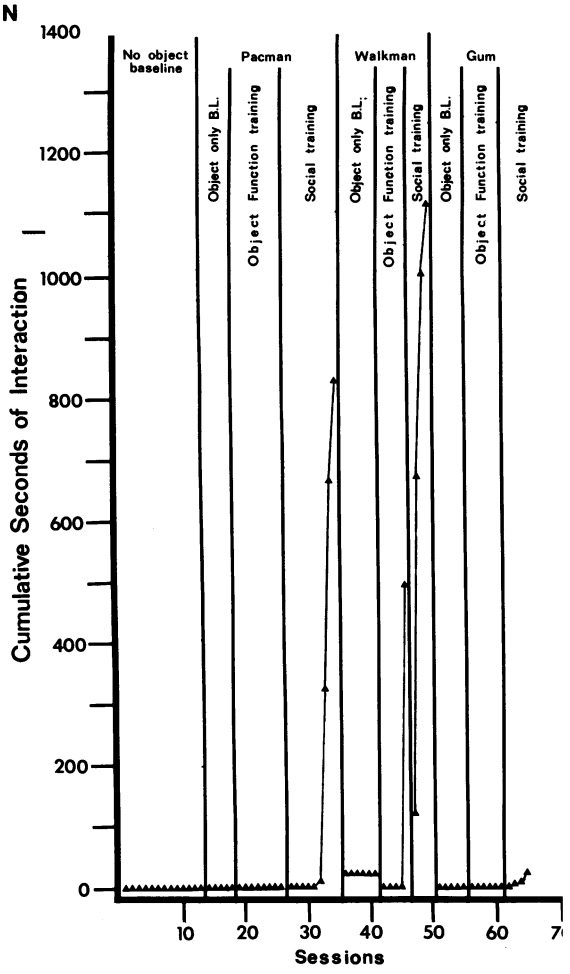

Figure 3. Cumulative seconds of autistic-initiated interactions with each object for Dan.

students on 14 occasions. Mike initiated interactions with peer tutors 29 times; familiar, nonpeer tutors 30 times; and unfamiliar students 14 times. Throughout the study Dan initiated interactions with 28 nonhandicapped students and Mike interacted with 33 nonhandicapped students. Thus, Dan and Mike tended to interact with familiar students. These data were not controlled, though, and must be interpreted with caution. Students who were familiar tended to spend more time in the courtyard and were, therefore, more available to interact with. Also, there was no control put on the number or proportion of familiar and unfamiliar students in the courtyard at a given time.

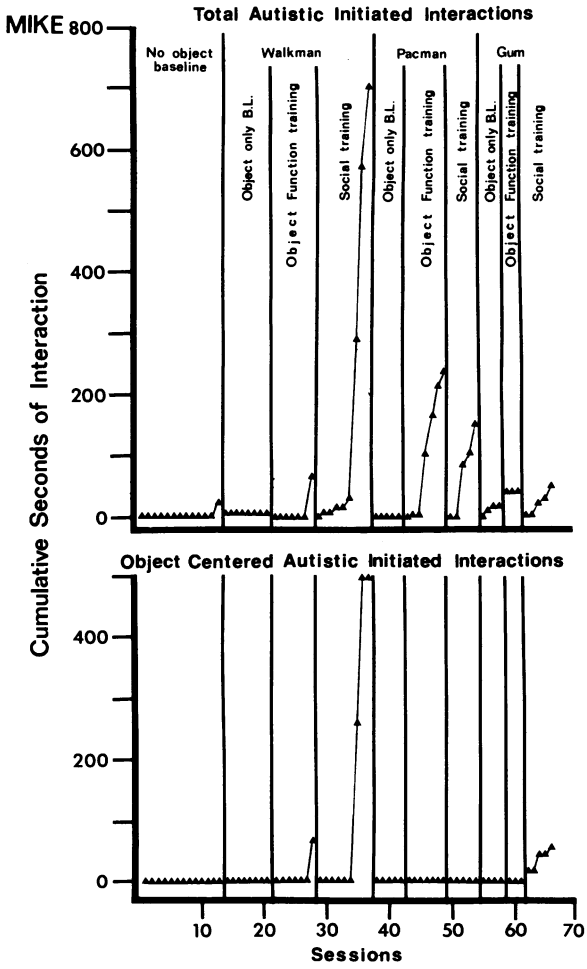

Figure 4. Cumulative seconds of autistic-initiated interactions with each object for Mike.

Interactions initiated by the nonhandicapped students (NI) were separately analyzed. With Mike, the nonhandicapped peers initiated interactions with the following means (number of interactions per session): no-object baseline, 0.67; object-only baseline, 0.71; function training, 1.2; and social skill training, 1.5. Thus, when comparing the social skill training data to the initial no-object baseline data, Mike was approached more than twice as frequently after he was trained to manipulate and offer the objects. Dan's data produced a contrasting pattern of results. During the no-object baseline condition, Dan received a mean of 0.11 initiations by the nonhandicapped students. A mean of 1.8 was observed during the object-only baseline condition, 1.5 during function training, and 0.88 during social skill training. Although Dan became somewhat less "popular" as the conditions were progressively layered in, he was eight times more likely to be approached during the final condition of the study than he was during the initial, no-object baseline condition. To summarize, both Mike and Dan received substantially more initiations from the nonhandicapped students after the participants were trained to manipulate the objects and initiate social interactions. Throughout the study, nonhandicapped students initiated social interactions on 85 occasions with Mike and on 41 occasions with Dan.

Finally, a series of maintenance probes was run with Dan and Mike 4 months after the cessation of training. The probes were run in the same courtyard setting at break times for 15-min periods with the Walkman. On two probes Dan initiated one interaction for 222 s and one interaction for 316 s. In one probe Mike initiated no interactions.

Discussion

In Experiment 1, we demonstrated that social skill sequences with differing objects can be successfully taught to autistic youth. Furthermore, when a variety of persons (training exemplars) are used, there can be a considerable amount of generalized responding in nontraining contexts. The success of the social skills training package was highlighted by the consistent functional relationship of bringing a student to training criterion and an immediate increase in generalized responding. The consistency of effects across objects and students further supported the efficacy of the training package. Dan and Mike did learn to approach and interact with nonhandicapped students at the rate of one to three interactions per break. In addition, during the interactions that lasted 1–3 min, even when the interactions were not object-centered (e.g., Mike–Pacman), the student emitted pertinent social behaviors to sustain an interaction.

The social validity of the behavior change could be inferred by examining the frequency of initiations by the nonhandicapped students. The NH

initiation data for Mike and Dan indicated that, compared to object baselines, considerably more initiations occurred when the objects, object function, and social skill training conditions were introduced. These data indicate that the autistic students were perceived as more desirable to interact with as a function of the intervention.

The objects themselves were initially selected because of their interest to the nonhandicapped students; that is, before the study began, observations of the NH students at the high school showed that many of them listened to Walkman radios shared food during breaks from classes, and played video games at off-campus arcades.

Finally, it is possible that the experimental design of gradually layering object training and social skill training after baseline may have inhibited generalization. The participants may have developed a pattern of not responding in the probe setting because they had extensive experience manipulating the objects during the object-only baseline prior to any social interaction intervention. In fact, higher frequencies of generalized initiation were observed during the second generalization probe time when the participants had not undergone repeated sessions of nonresponding.

EXPERIMENT 2

A second experiment was designed to replicate the effects of the training package with another autistic student. In addition, the experimental design and treatment package were altered to control for the problem of repeated baseline measures. Also, the object training phase was combined with social skill training. In Experiment 1, we showed that object training had little influence on the social aspects of social skill training. From a practical point of view, teachers are more likely to teach the social and object manipulation behaviors at the same time.

Method

Participant

Jim was an 18-year-old student who attended the same special education class as the participants in Experiment 1. He was diagnosed autistic by an agency independent from the staff conducting the study. He displayed a number of self-stimulatory behaviors on a daily basis that included body rocking, hand waving, grimacing, and twirling fingers in front of his face. Jim voluntarily spoke to request food items. He could follow 2-step commands and had a receptive vocabulary of about 200 words. He could successfully work on a task for 20–30 min. He would greet familiar persons by putting his hand out to gesture hello. He would not spontaneously say "hi" to others. Jim would approach familiar persons at times and place his face a few centimeters from the face of the other person. After a couple of seconds of this behavior, he would often run away from the person with a gleeful laugh. In most social situations Jim was isolate. When he was in proximity to others he rarely oriented his body in a proper frontal manner; he rarely gave eye contact.

Procedure

Separate generalization and training sessions were conducted. Training sessions occurred in both the courtyard and classroom settings. Training sessions were separated by at least 1 hour from generalization probes. Jim was trained to manipulate and socially initiate with three objects; a hand-held "Galaxian" video game, a Sony Walkman with two stereo headphones, and gum (see Table 3 for task analyses). The order of exposure to the objects was gum, Walkman, and Galaxian. All probes and training sessions were begun with the cue "go take a break."

Generalization data were collected using the same response definitions as in Experiment 1. The probes were taken daily at lunchtime and lasted for 15 min. Previous to training a series of no-object baseline probes was run. During training, no-object and object probes were run in alternating fashion. Toward the end of the condition only object probes were presented. Twelve reliability checks were made across baseline and training conditions. Interobserver agreement was calculated in the same manner as in Experiment 1. The percentage of agreement for the frequency of autistic initiations and frequency of nonhandicapped initiations was 100% on all checks. The range of the percent agreement

scores for the duration data was 92% to 100% with a median of 96%. There was 100% agreement on the interactants and whether or not the interaction was object-centered.

Design

We used a multiple-baseline design across the three objects for training with concurrent generalization probes. Jim was first exposed to a baseline condition in the classroom and courtyard settings. He was given an object and a cue to take a break. The trainer then counted the number of responses from the task analysis for each object that Jim produced, regardless of their order of appearance. No prompts or reinforcers were given.

Approximately half of the training sessions were conducted in the special education classroom and half in the courtyard. During all training sessions, one nonhandicapped female peer was present within 5 m of Jim. The same peer served in the experiment on a daily basis so that only one person (exemplar) was used in Experiment 2. As before, the peer was pretrained using a script of possible social responses. The script for Walkman and gum were identical to that in Experiment 1. The script for Galaxian was identical to the script for Pacman in Experiment 1 (see Table 3 and insert Galaxian for Pacman). Following baseline, social skill training was sequentially introduced in a multiple-baseline fashion. As in Experiment 1, each training session began with an unprompted and nonreinforced retention trial. The same prompting and reinforcing procedures used in Experiment 1 were applied to teach these three tasks. The only difference between experiments was that the manipulation of the objects was taught with the social skills.

Reliability data on the social skills training were collected in the same manner as in Experiment 1. There were 10 reliability checks on the accuracy of scoring the steps in the task analyses. Interobserver agreement was 100% on all checks.

Results and Discussion

Jim successfully learned the social skill sequences for the three objects. He sustained about a 10%–20% level of correct responding in the baseline trials. In the training condition his training and retention trial performance gradually increased to the 90%–100% level. The profile of acquisition of the social behaviors across the three objects was similar to Figure 1.

Jim displayed a substantial rate of generalized social (AI) responding (see Figure 5). During the no-object baseline condition there were no initiation responses. When the training package was introduced, generalized responding both with the objects and without (baseline probe) was observed. The duration of the interactions was also substantial. Figure 6 shows the cumulative number of seconds of interaction across training conditions and object type. There was little interaction in the initial baseline and following training with Walkman; more extended interactions were observed following training with gum and Galaxian. Interestingly, no-object (baseline) probes run after social skill training had been instituted produced a frequency of initiating social interactions (1.14 per break) which was similar to the frequency produced when Jim had objects (1.06). Thus, Jim was interacting with his handicapped peers (approaching, speaking) even when he did not carry a break time object. The mean duration of the no-object probes during the social training condition was 11.2 s. Similarly, when Jim was probed with gum, he rarely used the gum to initiate social behaviors because he usually chewed the gum. Instead, as in the no-object probes, Jim approached, greeted, and positioned himself in proximity to peers and, at times, conversed with his peers. His mean duration of interaction was 27.4 s/session with gum, 14.5 s/session with the Walkman, and 155.6 s/session with the Galaxian video game.

Like the students in Experiment 1, Jim tended to interact with students who were familiar to him. Across all sessions he had the following number of interactions: peer tutor, 29; familiar, nonpeer tutor, 10; unfamiliar peer, 2. Again, these results must be interpreted with caution because of the lack of control of the peers in the courtyard setting.

In contrast to Experiment 1, there were systematic differences in the nature of the interactions initiated by nonhandicapped peers. There was little time spent interacting in the baseline probes (both

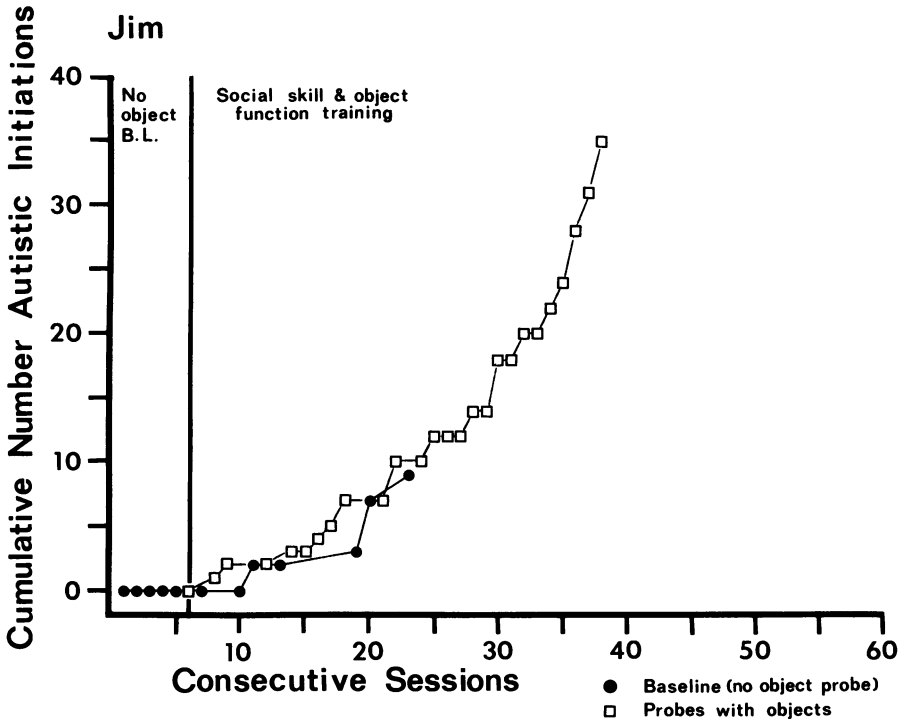

Figure 5. Cumulative number of social interactions for Jim.

initial and extended). Figure 6 shows that there was a substantial amount of time in NI object probes after training had been instituted. The interactions were object-centered for Walkman and Galaxian but not for gum. For example, peers approached Jim and they initiated an interaction by requesting to see the radio or videogame. The peers approached him when he had gum but no sharing of the object occurred. Yet, social interactions transpired (greetings, conversation).

Finally, a maintenance probe with the Walkman, lasting 15 min, was run in the courtyard 4 months after the completion of training. Jim initiated one interaction (which lasted 46 s) in the session.

GENERAL DISCUSSION

Persons referred to as autistic are characterized by their socially withdrawn behavior. The three youths in these experiments had spent from 1 to 3 years in a highly "integrated" school setting where they had substantial daily contact with nonhandicapped peers. In spite of this contact the autistic students initiated essentially no interactions with their peers before a training procedure was instituted. The absence of social interaction between handicapped and nonhandicapped students prior to training is in agreement with previous work on this topic (cf. Guralnick, 1978).

To encourage social interaction with their peers, the autistic students were given objects that were appealing to their nonhandicapped peers and that required little or no verbal explanation. In a break time setting the mere possession of the attractive object or separate training in how to use it did not lead to social initiations and interactions by the autistic students. It was necessary to train the students in such related social skills as greeting and positioning before they began to initiate and sustain interactions with their peers.

The training procedure was successful in teaching acquisition of social skill sequences. Within the training context the youth initiated and sustained

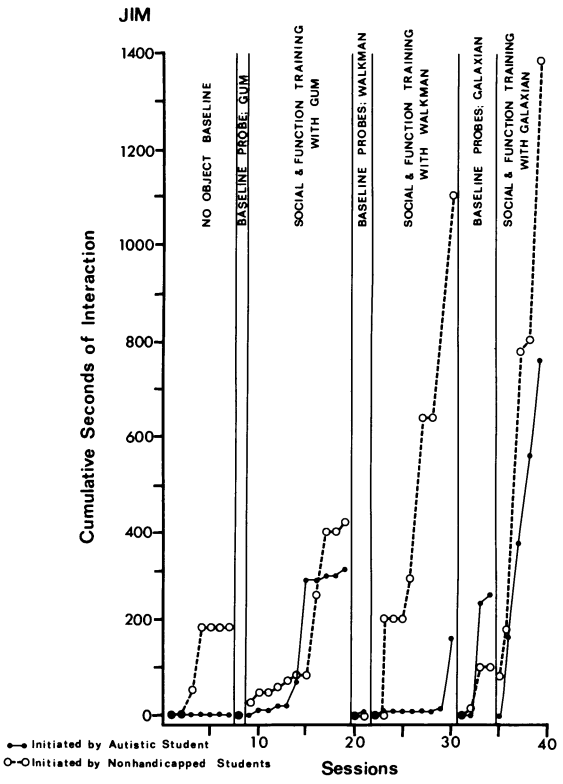

Figure 6. Cumulative number of seconds of autistic-initiated and nonhandicapped peer-initiated interactions with each object for Jim.

interactions with a variety of persons and play objects. Attention should be given, though, to the types of students with which this procedure could be used. Participants were functioning at the severe and moderate levels of retardation. They were capable of learning the multiple-step social sequences in a rapid and simultaneous fashion. Students with more profound handicaps may have disabilities that would limit their learning of the social sequences in the manner presented here. The sequence may have to be taught in a slower, serial manner rather than with the total task, concurrent procedure used here. Also, videogames like Pacman and Galaxian may be too complex for students with profound handicaps.

The most impressive finding in the study was the considerable amount of social responding by the participants during the unstructured breaks. The autistic youths were initiating interactions with nonhandicapped peers at a rate of one to three encounters in a 15-min break period. The interactions also lasted for a substantial duration (0.5 to 3 min) and were centered either around the play objects or other prosocial activities like simple conversation. The successful training of longer duration encounters extends previous work that taught brief greeting responses to retarded and autistic persons (Haring, 1978; Stokes et al., 1974).

Part of the success of the generalization training procedure may be due to the use of multiple training exemplars (persons). In training, the autistic youth was exposed to different nonhandicapped peers across trials. This simultaneous training (Stokes & Baer, 1977) or systematic variation of persons led the student to generalize his social responses to other peers in the probe setting. Previous work, which failed to produce generalization of social behavior among autistic persons, has used a single exemplar training approach, i.e., one autistic student with one nonhandicapped student. Yet, our conclusion must be qualified because multiple person training occurred only in Experiment 1. In Experiment 2 there was successful generalization, but Jim was exposed to the same peer throughout training. Part of Jim's success with a single training peer was that he was considerably "higher functioning" than the participants in Experiment 1. He had more social and language skills prior to the onset of the study than did Mike or Dan. Thus, single-person training might have been sufficient to produce generalization given his current abilities. We do not know whether single-person training would have been successful with Mike and Dan because they were only exposed to the multiple exemplar case. Certainly, future research should investigate the number of training persons necessary for the generalization of social behaviors among autistic persons.

The generalization of social behaviors in this study was across persons (and time) but not across settings. The probe setting was in the same courtyard at different times of the day. Within this setting the autistic youths tended to approach and interact with familiar peers. These were peers with

whom they did not receive social skills training, but students who spent considerable time in the special education classroom or the probe courtyard or both. The tendency to interact with familiar peers may explain the inconsistency in the maintenance data. Two of the three participants maintained the social interaction skills 4 months after training. Training was terminated at the onset of summer vacation, and the maintenance probes were taken the following fall. As a consequence, many of the familiar peers from the year before were not present in the fall. Therefore, the failure of Mike to demonstrate maintenance of the social skills could be due to forgetting the skills in the summer or to changes in the population of nonhandicapped people in the courtyard.

In terms of social validity it is important to identify the types of settings and persons that are targeted for stimulus generalization. In the social behavior domain, it is not desirable for handicapped persons to approach any person in all settings for social interaction. Unwanted outcomes could accrue from such overly generalized response tendencies. It is more appropriate for individuals to interact with familiar persons in familiar settings. In this study, the autistic youths did approach familiar peers in a familiar setting. Future educational and research efforts should attend to the types of settings or environments in which social responding is to occur. In a person's typical day there are contacts with familiar persons in familiar settings, e.g., the corner newsstand, the "ma and pa" store. Within these environments it is appropriate to initiate social contacts. In more transient settings, like public restrooms, it is generally not advisable to approach unfamiliar persons. A comprehensive understanding of the socialization of autistic persons should include a delineation of the environments in which social behaviors are promoted (generalized) and a designation of those settings in which generalized social responding should occur. When describing these social subenvironments it is important to keep abreast of what is fashionable and of interest to the nonhandicapped peer group. Videogames and radios were used here to promote extended interactions. With other age groups or with changing fads the types of play objects used may differ. The key factor is that objects should be selected that are likely to be reinforcing both to the handicapped and nonhandicapped person. If the reinforcement preferences of the nonhandicapped peer are not considered, there is little likelihood that this individual will sustain interactions in a generalization setting where no external reinforcers are delivered by a teacher or therapist for interacting with a handicapped person.

When considering the dyadic nature of social interaction it should be remembered that this study focused only on the training of the handicapped youth to be an initiator and sustainer of interactions. Some previous work has lodged all the training efforts with the nonhandicapped peer (for a review of this work, see Strain & Kerr, 1981). It would, of course, be possible to have a training package for both members of the dyad (cf. Baldwin, 1983). Future research should investigate the different member components of a social skills training package that will maximize a natural reciprocity of social exchanges (Piaget, 1951). Also, the role of the object in facilitating social interaction should be studied. Quilitch and Risley (1973) found that certain types of objects facilitated cooperative play and others led to isolate play. Here, certain objects led to longer duration interactions than others. It was assumed that the object served as a social "prosthetic" to facilitate interaction among peers who ordinarily had no common language or cultural base on which to build interactions. Although the play objects served this function, there were other instances where nonobject-centered interactions seemed to evolve from the social behaviors that had been learned by the autistic youth. For instance, Jim emitted social responses in the no-object probe after he received social skill training. He also emitted social responses in object probes that did not revolve around the object, e.g., greeting, approaching, conversing, but not playing Galaxian. Similarly, Mike emitted many social behaviors in object probes that did not center around the play object. Dan differed in this regard in making almost all his social responses

object-centered in the probes. Thus, the individual differences in social behavior across youths could be due to endogenous differences in social development or some characteristic of the treatment package. It can be stated that the social skills training package successfully produced generalized responding but it is not clear whether the play objects were essential in producing this effect. In conclusion, the relation between object, training, and related variables appears to be a fertile ground for future research to investigate the most effective ways to promote the social development of autistic persons.

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