*EFFECTS OF HIGH-PROBABILITY REQUESTS ON THE
SOCIAL INTERACTIONS OF YOUNG CHILDREN WITH
SEVERE DISABILITIES*

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High-probability requests were used to increase social interactions in 3 young boys with severe disabilities who had been identified as severely socially withdrawn. A multiple baseline design across participants was used to evaluate the effects of high-probability request intervention on (a) social initiations, (b) social responses, (c) continued interactions, and (d) performance of high- and low-probability requests. The students were observed in a second setting to examine generalization effects across peers who did not participate in the training sequence and settings. The results demonstrated that the high-probability requests increased the students' responsiveness to low-probability requests to initiate social behavior. Increases were also found in (a) unprompted initiations and extended interactions to the training peers, (b) unprompted initiations and extended interactions to peers who were not involved in the training procedure, and (c) generalized unprompted initiations and interactions in a second nontraining setting. The students maintained increased levels of initiations and interactions after all prompts were removed from both the training and nontraining settings.

DESCRIPTORS: high-probability requests, social interaction skills, generalization

High-probability (high-*p*) request sequences have been used to increase appropriate behavior during transition from recess to instructional group time (Singer, Singer, & Horner, 1987), compliance with self-care routines (Mace et al., 1988), compliance with a self-medication regimen (Harchik & Putzier, 1990), attempts to complete tasks (Horner, Day, Sprague, O'Brien, & Heathfield, 1991; Mace & Belfiore, 1990), and generalized responding (Davis, Brady, Williams, & Hamilton, 1992). Only one study to date has extended the high-*p* sequence to

produce increases in skills other than simple compliance. Sanchez-Fort, Brady, and Davis (1992) used the high-*p* sequence to increase the use of signed words in 2 young girls with severe disabilities. The authors considered the nonuse of signs and speech similar to low-probability behavior. Thus, words and signs, identified as low-probability (low-*p*) requests, were preceded by a series of high-*p* requests and social reinforcers. One purpose of the present study was to investigate the applicability of the high-*p* request sequence to social outcomes.

Students with severe disabilities are frequently reported to have difficulty interacting with others (for reviews see Brady & McEvoy, 1989; Gaylord-Ross & Peck, 1985; Odom & Strain, 1984; Strain & Fox, 1981b). A number of technologies have been developed to overcome the social-skills deficits of many of these youngsters. Although a thorough

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review of related topics (such as social networks, ecological factors, attitudes, setting events, etc.) is beyond the scope of this paper, it is important to summarize the progress made in improving social skills. To date, three direct intervention strategies—adult-mediated prompts, peer-mediated activities, and affection activities—have been used to increase social interactions between children with and without disabilities (Odom & McEvoy, 1988). These interventions are based on the premise that social interactions are reciprocal; that is, social interactions become mutually reinforcing and thus increase the probability of the continuation of the interaction and interacting in the future—what Stokes and Baer (1976) refer to as a reinforcement trap.

The use of high-*p* requests to increase social initiations, together with the mutual reinforcement of reciprocal interactions that maintain social responding, seems a logical step in the expansion of knowledge in both areas (i.e., high-*p* requests and social interactions). The primary goal of this study was to evaluate the applicability of high-*p* request sequences to outcomes beyond simple responding to requests (to social interactions) and to populations only recently included in this research (young children who are severely disabled and socially withdrawn). Two research questions were posed in this study: (a) Will the use of a high-*p* sequence increase the social interactions of young children with severe disabilities toward youngsters without disabilities? (b) If increases in social interactions are found, will similar but spontaneous increases (in the absence of training) be produced toward children without disabilities who do not participate in the high-*p* training sequence in a second, nontraining environment (nontraining setting)? Thus, we assessed the basic efficacy of the high-*p* intervention for increasing social interactions, and the extent to which the effects might generalize to children and settings that are not part of the training sequence.

METHOD

Participants

The participants in this study were 3 young boys with severe disabilities. Max, 5 years old, was identified as autistic, mentally retarded, and speech

handicapped (Autistic Behavior Scale: 26/severe; WIPPS-R: below 45; Vineland: all scales in the severe range). His teachers identified him as extremely isolated in play and unwilling to participate in activities that require him to interact with other students or teachers. Max typically "hoarded" toys and seldom approached or played within 3 m of another child. When another child approached him, he often left the area and took his activity with him. Max could repeat two- and three-word phrases upon request, but typically pointed and said "what's that," "want . . ." to obtain objects or attention.

Tim was a 6-year-old boy diagnosed with autism, mental retardation, and speech handicaps (Autistic Rating Scale: 20/severe; Leiter: below 30). He spent most of his time engaging in stereotypic handflapping, ear or head slapping, and yelling. Tim typically engaged in stereotypic play with a deck of cards and a small box of blocks. His teachers considered him to be extremely withdrawn. He engaged in frequent echolalic speech, primarily repeating the last word or two words of a speaker's phrase. When an adult entered his classroom, Tim typically stood in front of the person, leaned forward, and exhibited an exaggerated facial expression such as raised eyebrows, squinted eyes, and wrinkled nose.

Alan was a 6-year-old boy classified as autistic, mentally retarded, and speech handicapped (Autistic Behavior Checklist: 23/severe; Leiter: below 30). His teachers reported never observing Alan play with other children. Alan's typical play pattern consisted of spinning puzzle pieces, spinning the wheels on cars, flipping through pages of a book, and rocking U-shaped building blocks. Alan accompanied each of these patterns of play with clapping, patting his leg, or patting his chest.

All 3 boys could imitate simple motor tasks and verbalizations when requested to do so. This was determined prior to the study by an experimenter who delivered 10 imitative requests each for 5 consecutive days. All boys completed the imitative behaviors with 100% accuracy. In addition, each student's individual education plan (IEP) had a related social skill to increase his rate of social initiations.

Eight boys and girls without disabilities were

selected to participate in two play settings for each of the 3 boys. For Max and Tim, the peers without disabilities were from the first grade of each student's respective school. The peers without disabilities chosen for Alan ranged from 4 to 8 years old. All peers without disabilities knew each participant prior to the study. Max and Tim attended assemblies and classroom parties with the peers without disabilities. Alan was in the same afterschool class with the peers without disabilities. For each of the 3 participants, 4 of the peers were designated as "training peers" and were involved as training agents in the high-*p* request sequence. The remaining peers were designated as "generalization peers." They were present in the training and nontraining settings but were not present during the high-*p* request sequence. Criteria for selecting peers without disabilities were (a) generalized compliance to adult requests, (b) a record of good daily attendance, (c) social skills reflective of typical interaction patterns of same-aged peers, and (d) a willingness to participate in the play activities. The peers were observed for 1 month for Max and Tim and for 2 weeks for Alan prior to the beginning of the study.

Instructors

All trials of low-*p* and high-*p* sequences were conducted by the primary investigator, the children's teachers, and a graduate student in special education. Each was taught to implement high-*p* requests prior to the low-*p* request. This training consisted of three phases: (a) reading a written description of the procedures (including a sample script), (b) observing the procedure delivered by the primary investigator in a role-play situation, and (c) practicing the procedure in a role-play situation while the observers, both primary and secondary, collected data. This permitted feedback on the delivery of requests and the mechanics of the procedure (i.e., interprompt time and reinforcement schedule). This training took place 1 day prior to the implementation of the high-*p* condition.

Setting and Materials

The study was conducted in each participant's regular integrated play settings (i.e., regular school

campuses for Max and Tim and public afterschool day care for Alan). Two play settings were chosen for each participant, a training setting and a nontraining setting. For Max and Tim, the play area in each student's self-contained classroom served as the training setting. Each play area was carpeted and consisted of approximately one half of the total classroom area. Shelves holding toys lined one wall of both play areas. Playgrounds served as the nontraining settings for Max and Tim. On days of inclement weather, the nontraining settings were the first grade classrooms of the peers without disabilities. The training setting for Alan was the block and book area of the day-care classroom; a vacant classroom across the hall from the training setting served as the primary nontraining setting, and the outside playground was used in this capacity when weather permitted. Each setting included age-appropriate peers without disabilities with free access to all peers, toys, and materials.

Toys were selected on the basis of each child's preference and each toy's history of influencing child-to-child interactions (see Martin, Brady, & Williams, 1991). These toys included motorized toys (e.g., Silly Soup®, Bed Bugs®, Boggle Junior®, and Perfection®), building blocks, cars, Legos®, balls, and jump ropes.

Behavioral Measures

During all baseline and intervention sessions, data were collected on responses to low-*p* requests, delivery of high-*p* requests and peer interactions.

*Responses to low-*p* requests.* Low-*p* requests were those social requests to which the student had a history of being unlikely to respond; in particular, requests to extend a social initiation to a training peer without disabilities. A pool of low-*p* social requests was determined for each child individually by asking the teacher, instructional assistant, and parents; examining the IEP; and observing the participant in the integrated play settings. To ensure that the child could perform the low-*p* requests, 10 trials of each low-*p* request were delivered and a percentage of correct responding was calculated prior to the study. Those requests responded to on less than 50% of the opportunities were considered

Table 1
Low-Probability and High-Probability Requests for Participants

Participant	Low- <i>p</i> request	High- <i>p</i> request
Max	Give the toy to [peer]. Put the block on top of [peer]s. Chase [peer]. Share the [toy].	Give me five. Pick up the toy Touch the block. Touch the hippo.
Tim	Share the phone. Throw the ball to [peer]. Give the toy to [peer]. Roll the car to [peer]. Say, "Toy please."	Point to [toy]. Pick up the [toy]. Sit down. Touch [toy]. Pick up [toy].
Alan	Roll the tractor to [peer]. Push the car to [peer]. Build a tower with [peer]. Roll the toy to [peer].	Give me five. Touch the [toy]. Pick up the [toy]. Touch [color].

low-*p* requests. The middle column in Table 1 lists the specific low-*p* requests for each student.

High-*p* requests. High-*p* requests were instructions or requests with which each participant had a history of performing. These requests were determined similarly to the low-*p* requests. That is, the investigators observed the student, questioned the teachers and parents, and examined the IEP. Ten trials of each high-*p* request were delivered to the participant to determine the probability of performance (i.e., with a criterion of 80% or greater). The right column of Table 1 contains a list of high-*p* requests for each child.

Peer interactions. Interactions between the participants and the peers without disabilities were measured using an adaptation of an observation system developed by Fox et al. (1984) (see also Brady et al., 1984; Brady, Shores, McEvoy, Ellis, & Fox, 1987; McEvoy et al., 1988). Three general classes of peer interactions were recorded: *initiations*, *responses to initiations*, and *ongoing interactions*. An initiation was any motor or verbal behavior directed to a peer that could occasion a social response. A response was any social behavior that acknowledged a reply to an initiation within 3 s. Ongoing interactions were defined as reciprocal social behavior that continued for more than 3 s past the original initiation-response sequence. An interaction that ceased for 3 s was coded as terminated. Each of these classes were coded as either

desirable or undesirable. For example, desirable initiations consisted of sharing, greeting, and touching; undesirable initiations included hitting, pinching, and crying. In addition, observers recorded whether the social interactions were directed to training peers or generalization peers.

Observation Procedures

Data collection. Observers were trained to record all requests and target social behavior for all participants and peers. Observers collected data standing approximately 3 m from the student by talking into hand-held microcassette recorders. This was done by activating the tape recorder and simultaneously saying "start" into the recorder. The recorders ran continuously while the observers recorded the children's behavior. For example, upon observing an initiation to a training peer with a response from that peer, the observer recorded "Tim initiated to training peer . . . response from training peer . . . continued interaction . . . continue . . . stop, Tim ran away." Following each session, the data were transcribed onto time-based summary sheets by beginning the tape recorder and a stopwatch simultaneously and recording on the summary sheets the time the data were recorded. Percentage of time spent interacting was calculated by dividing the total number of seconds the target participant spent engaged in an interaction by the total number of seconds observed. Tape-recorded

Table 2
Interobserver Agreement Results (Percentage Scores)

Participant	Desirable initiations	Desirable responses	Duration of interactions	Low- <i>p</i> requests	High- <i>p</i> requests	Procedural integrity
Max						
<i>M</i>	84	87	80	96	94	95
range	62–100	76–100	64–100	89–100	87–100	86–100
Tim						
<i>M</i>	89	78	94	98	95	97
range	75–100	62–100	90–100	96–100	90–100	90–100
Alan						
<i>M</i>	80	81	79	97	89	92
range	67–100	73–100	59–100	96–100	86–100	88–100

data included (a) participants' prompted initiations (i.e., those initiations preceded by a low-*p* request), (b) unprompted initiations by participants and peers, (c) responses to initiations, (d) prompted interactions by peers and participants (i.e., those interactions that were a result of a continuation of a prompted initiation), (e) unprompted interactions, (f) delivery and response to high-*p* and low-*p* requests, and (g) interprompt time (i.e., time between the reinforcement of the previous request and the delivery of the next request).

Ten minutes of continuous data collection took place in two different integrated play settings (the training and nontraining settings) for each participant. All students entered the training and nontraining settings at the same time. Before collecting data in each session, a 4-min "warm-up" period occurred. This allowed the youngsters to adapt to the new activity and avoid spuriously high or low interactions or responses to requests typically associated with shifts in routines.

Interobserver agreement. Interobserver agreement was collected concurrently by a second independent observer standing approximately 6 m from the primary observer. The noise in the play environment required the observers to speak directly into the tape recorders held to their mouths. The position of the recorders and the noise in the play setting reduced the probability of the two observers hearing each other while collecting data. Interobserver agreement checks were conducted on 30%, 31%, and 28% of the sessions across all

conditions for Max, Tim, and Alan, respectively. Agreement measures were calculated category by category by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%. Agreements for most response measures used a ± 5 -s criterion. Data on the procedural integrity of the administration of the high-*p* and low-*p* requests were collected for the verbal emission of the requests and for interprompt time (IPT). However, for the interprompt time, an agreement was scored when the two observers recorded the same IPT ± 2 s. Table 2 shows interobserver agreement results.

Finally, two methods were used to assess the reliability of the data transcriptions. That is, test-retest reliability within an observer and across two observers was calculated for 12%, 13%, and 14% of all transcriptions for Max, Tim, and Alan, respectively. This reliability was 100% across all transcriptions and students.

Procedure

The study consisted of five experimental phases: (a) collection of normative data on initiations and reinforcement, (b) peer training, (c) baseline, (d) the high-*p* intervention, (e) the prompt-removal procedures (including follow-up probes), and (f) generalization assessment.

Collection of normative data. Prior to baseline procedures, observations were conducted to obtain normative data on the rate of social initiations among peers. One child was randomly selected from each

of the three play groups to be the target student. The observers then collected data on the target student's social behavior toward any other child in the training setting during a play session. These observations were conducted for 3 days for all students. The average rate of initiations was 0.8 initiations per minute. This value served as a guide to help to determine how frequently a low-*p* request should be issued to approximate natural peer interactions. Similar normative data were obtained on the rate of reinforcement by the children's regular teachers when responding to a request (similar to low *p*). This allowed the baseline to reflect reinforcement that was natural and free of intervention (i.e., not reflecting an increase in reinforcement during this phase). Each participant received a 1:1 ratio of verbal praise for performance of a verbal request during these conditions.

Peer training. Because children with social-skills deficits often exhibit social initiations that are not typical of peers without disabilities and, therefore, go unnoticed by the peer, it was necessary to teach the "training peers" to recognize each participant's initiations and responses. Training took place 2 days prior to the beginning of baseline. Peers were trained by first listening to the investigator describe a play situation specific to each participant's setting and available toys. Next, the investigator identified each target student's initiation. Peers were encouraged to describe what their response might be to the initiation. In addition, the training peers role-played social responses to possible target peer initiations. It should be noted that peers were not "trained" to respond to the initiations of the target participants, but were trained to identify an initiation. Finally, it was occasionally necessary for the investigator to deliver hand signals to the peers to wait for an initiation from the target participant and respond to the participant's initiation. This was done to control for possible confounding variables (i.e., increases in peer initiations). This "coaching" began with Session 2 and was used sparingly throughout the study.

Baseline. During baseline, each interventionist delivered low-*p* requests to each target participant. These requests were verbal requests to initiate in-

teraction with a training peer. Examples included "Max, give Brittney the marble," "Tim, ask Stacy to throw the ball," and "Alan, help Lennie build a stack." If the student performed the request within 3 s, the adult provided verbal praise and the student continued to interact with the peer. If the child did not perform the request, the interventionist waited approximately 75 s (established as the child's normative rate) and then delivered a new low-*p* prompt. Approximately eight trials were conducted throughout the integrated play sessions designated for training. As noted above, all baseline sessions were 10 min in length and provided activities and materials that were socially interactive. These sessions were attended by the target participant, the 8 peers without disabilities (both training and generalization), and the other students in the classroom.

High-*p* intervention. The setting and context of the activities remained the same as in baseline except that a researcher provided a hand signal to the interventionist to initiate the sequence of high-*p* requests. The sequence of events during the intervention was (a) three to five high-*p* requests delivered rapidly (i.e., within 10 s of each other); (b) verbal or gestural praise (thumbs up, waving hands in the air, patting the student's arm) for each request performed; and (c) the low-*p* request issued within 5 s after reinforcement for performing the last high-*p* request. In the event that a high-*p* request did not occasion a student response, the adult continued to issue high-*p* requests until three consecutive responses were obtained.

Prompt removal. The setting and context of the activities remained the same as in the previous phases. However, during these sessions, the children were allowed to play and interact with all toys and other children in the room without receiving any low-*p* requests or high-*p* requests from the adult. The children engaged in their usual warm-up period upon entering the training and nontraining settings and their interactions were then observed for the 10-min data collection period. The prompt-removal procedure was different from baseline in that this condition did not include low-*p* requests.

Follow-up probes. Follow-up probes were col-

lected at 1-week intervals for all participants. These probes reflected conditions that were implemented during prompt removal. That is, the data collectors observed and collected 10 min of continuous data. During this time, neither high-*p* nor low-*p* requests were delivered.

Generalization sessions. Participants were observed daily in a second setting to assess potential generalization across environments. The child receiving the high-*p* intervention and all peers without disabilities (both training and generalization peers) were present in these sessions. The adult did not use the high-*p* request sequence, but instead delivered a minimum of five low-*p* requests to interact if the children did not engage in reciprocal interaction within 75 s. Unprompted interactions or increases in baseline responses to low-*p* requests in the absence of the high-*p* intervention were considered to be indicators of generalization.

Experimental Design and Analysis

A multiple baseline design across participants was used to assess the effects of the high-*p* sequence on the children's social interactions. To assess potential generalization to a nontraining setting and nontraining peers, concurrent continuous data were collected in the nontraining environment and with generalization peers in both settings. To analyze the high- and low-*p* data, the numbers of high- and low-*p* requests, as well as student responses to these requests, were converted to percentages of successful high-*p* requests and low-*p* requests. Direct effects of the high-*p* sequence were analyzed by calculating each participant's rate of initiations and percentage of time spent engaged in ongoing interactions following the interventionist's low-*p* requests with the training peers in the training setting (i.e., prompted social behavior).

In addition to the data collected on prompted peer interactions with training peers in the training setting, data collected on participants' unprompted initiations and interactions to both training and generalization peers in the training setting showed one form of carryover of the high-*p* procedure (unprompted interactions with training peers) and a form of generalization (across-peer effects). In ad-

dition, a concurrent and continuous baseline in the nontraining setting, in the absence of the high-*p* sequence there, was an indication of across-setting generalization. Again, peer initiations and ongoing interactions in any setting that followed the teacher-delivered low-*p* requests were reported as prompted initiations or interactions.

RESULTS

Prompted Social Behavior in the Training Setting

Baseline. Figure 1 presents three sources of data (percentage of responses to requests, rate of prompted initiations, and percentage of time spent interacting). Percentage of responses was calculated using the student's number of responses or nonresponses to the high- and low-*p* requests. Because an appropriate response to a low-*p* request constituted a social initiation, responses to low-*p* requests were converted to rate of initiations. This rate measure has, in previous research, been found to be sensitive and robust for measuring changes in social initiations. Finally, the total number of seconds a child spent engaged in social interactions was divided by the total number of seconds observed, resulting in a percentage of time spent interacting.

All participants exhibited a low percentage of responding to the low-*p* request—11.4%, 9%, and 3%, for Max, Tim, and Alan, respectively. Prompted initiations and the percentage of time of prompted interactions with training peers also occurred at low levels. Note that the rate of prompted initiations was a function of the participant's responses to the low-*p* requests. That is, whereas the response to low-*p* data indicates whether or not the participant responded to the teacher's requests, the rate data show how this performance resulted in prompted social initiations to the training peers. Data also show the percentage of time the participants spent in interactions that were a result of the prompted initiation. Note that these extended interactions were a function of the low-*p* requests; if a teacher's low-*p* request resulted in an extended

interaction that the participant initiated, this was considered to be a prompted interaction. The rate of prompted initiations to training peers was low during baseline procedures, averaging 0.1, 0.09, and 0.025, respectively, for Max, Tim, and Alan. Although the training peers responded to each occurrence of prompted initiations from all 3 participants during the baseline conditions, none of these initiations led to ongoing interactions.

High-p sequence intervention. Responses to low-*p* requests for Max, Tim, and Alan increased sharply with the implementation of the high-*p* sequence to an average of 93.5%, 94.5%, and 98%, respectively. The rate of prompted initiations to training peers increased to a mean of 0.76, 0.75, and 0.78 per minute when the high-*p* request sequence was implemented for Max, Tim, and Alan, respectively. During intervention, the percentage of time engaged in prompted interactions with training peers increased from 0% for all 3 participants to a mean of 35% for Max, 33% for Tim, and 36% for Alan. Finally, on Session 24 for Max, Session 30 for Tim, and Session 37 for Alan, all prompts were removed from the training setting; any initiations occurred in the absence of a high- or low-*p* request and are discussed in the following section.

Unprompted Social Behavior in the Training Setting

Baseline. Results for unprompted social initiations and interactions with training and generalization peers in the training setting are displayed in Figure 2. Unprompted social behaviors in the training setting are represented by (a) the unprompted initiations from the participants to peers who were and were not a part of the training sequence, and (b) extended interactions that resulted from these unprompted initiations. Although unprompted initiations and interactions with generalization peers suggest across-peer generalization, a more modest indicator of generalization is the unprompted initiations and interactions with training peers in the training setting.

During baseline, unprompted initiations to train-

ing peers were low and averaged 0.04, 0.02, and 0 per minute for Max, Tim, and Alan, respectively. For both Max and Tim, unprompted initiation to generalization peers occurred during only one session (0.1 per minute). No unprompted initiations from Alan to generalization peers were recorded.

High-p intervention. Small increases in unprompted initiations and interactions with training peers during the high-*p* intervention were observed ($M = 0.2, 0.2$, and 0.3 initiations per minute and $M = 5.7\%, 6.7\%$, and 7.3% of the time observed) for Max, Tim, and Alan, respectively. Implementation of the high-*p* sequence increased unprompted initiations and interactions from Max and Tim to generalization peers in the training setting ($M = 0.1$ and 0.2 initiations and $M = 3\%$ and 8% interactions, respectively). Unprompted initiations from Alan to generalization peers were recorded on the 2nd day of intervention, although a continued interaction was not observed until the 4th day of intervention.

Prompt removal. When the high-*p* and low-*p* requests were removed on Session 24 for Max and Session 30 for Tim, an increase in the rate of unprompted initiations to training (averaging 0.4 and 0.6) and to generalization peers (averaging 0.3 and 0.3) was observed. Interactions to training peers averaged 27% and 38% of the time observed, whereas extended interactions with generalization peers averaged 22% and 21% of the session. For Alan, all prompts were removed from the training setting on Session 37. Although a decrease was initially seen (0 and 0.2 unprompted initiations), an increase in the rate of unprompted initiations (ranging from 0 to 0.8 initiations per minute) and time spent engaged in interactions with training peers occurred for the remainder of the sessions. Alan's prompted initiations and interactions to generalization peers reached higher levels than in previous conditions, ranging from 0.1 to 0.7 initiations per minute and 16% to 37% of the time observed.

Follow-up probes. Follow-up probes for Max and Tim began 2 weeks following the last day of continuous data collection in the prompt-removal phase and were collected on a weekly basis. For

Figure 2. Participants' unprompted initiations and interactions to either training or generalization peers in the training setting. The hashed component of the bar graph is the percentage of time the participant spent interacting with a training peer. The clear component of the bar graph is the percentage of time the participant spent interacting with generalization peers. The total (hashed plus clear) bar graph represents the total amount of time the participant spent engaged in interactions with generalization and/or training peers. Those bar graphs that show an overlap indicate the amount of time the participant spent engaged in a three-way interaction with both training and generalization peers. Follow-up probes were collected at 1-week intervals. "A" indicates absence of participant.

Alan, follow-up probes began 1 week after the last day of continuous data collection in the prompt-removal phase. Unprompted initiations from Max to training peers ranged from 0.1 to 0.6 initiations per minute and resulted in continued interactions ranging from 3% to 43%. Social behavior exhibited by Max to generalization peers remained stable at high levels ranging from 0.2 to 0.6 initiations per minute and 11% to 35% of the total 10-min session spent interacting. Follow-up probes for Tim showed initiations ranging from 0.3 to 0.8 per minute, and ongoing interactions ranging from 3% to 58% to training peers. Similarly, social behavior by Tim toward generalization peers maintained initiations ranging from 0.3 to 0.8 per minute, and the extended interactions ranged from 10% to 44%. Social behavior exhibited by Alan toward training peers remained at levels established during the prompt-removal phase (0.2 to 0.8 initiations per minute and interactions 5% to 45% of the time available to interact). Alan's weekly follow-up probes yielded initiations to generalization peers ranging from 0.2 to 0.8 initiations per minute, with ongoing interactions ranging from 8% to 42% of the total time available to interact.

Prompted Social Behavior in the Nontraining Setting

In the nontraining setting, low-*p* requests to initiate to training peers were delivered only if initiations did not occur for an extended period (see Behavioral Measures). Data for initiations and ongoing interactions following teacher-delivered requests are presented in Figure 3. During baseline, none of the participants responded to any of the low-*p* requests. While intervention procedures were being implemented in the training setting, low-*p* requests continued to be delivered in the nontraining setting. Max's prompted initiations ranged from 0 to 0.5, and the duration of these interactions with training peers ranged from 0% to 44% of the total time observed. For Tim, an increase in prompted initiations in the nontraining setting was recorded 2 days after the intervention had been implemented in the training setting (ranging from 0.1 to 0.5 initiations per minute). In addition, a substantial increase in the duration of interactions was recorded,

ranging from 4% to 53% of the total time observed. Alan began to respond to low-*p* requests in the nontraining setting (Session 20) and continued to do so throughout the remainder of the intervention phase. These prompted initiations to training peers ranged from 0 to 0.5 initiations per minute. Ongoing prompted interactions that occurred during the intervention phase ranged from 3% to 43%. On Sessions 24, 30, and 37, all low-*p* prompts were removed and all initiations became unprompted (see following section).

Unprompted Social Behavior in the Nontraining Setting

Baseline. Unprompted social behaviors with all peers were recorded in the nontraining setting and are presented in Figure 4. During baseline, none of the unprompted initiations resulted in extended interactions for Max, and no unprompted initiations to generalization peers were recorded. Unprompted initiations by Tim were recorded at the rate of 0.1 per minute for three sessions to training peers and one session to generalization peers. None of these initiations were extended to interactions. Alan did not initiate to training or generalization peers in the nontraining setting during baseline.

High-*p* sequence intervention. With the high-*p* sequence in the training setting, unprompted initiations from Max to training peers remained low (0.1 per minute) for 2 days, but increased during Sessions 11 through 23, ranging from 0 to 0.7 initiations per minute and 0% to 55% of interactions. Initiations from Max to generalization peers ranged from 0 to 0.9 per minute, and the ongoing interactions ranged from 0% to 61% of the total time observed. Tim began to initiate more (range, 0.0 to 0.7) and spend more time engaged in unprompted interactions with training peers (range, 0% to 53%). Unprompted initiations to generalization peers ranged from 0.1 to 0.7 initiations per minute, and interactions ranged from 0% to 51% of the total 10-min session. Alan's unprompted initiations to training peers ranged from 0 to 0.5 and to generalization peers ranged from 0 to 0.4 initiations per minute, and total interactions ranged from 0% to 31% of the time available.

Prompt-removal phase. When the low-*p* and

Figure 3. Participants' prompted initiations and interactions with training peers in the nontraining setting. "A" indicates absence of participant.

Figure 4. Participants' unprompted initiations and interactions to either training or generalization peers in the nontraining setting. The hashed component of the bar graph is the percentage of time the participant spent interacting with a training peer. The clear component of the bar graph is the percentage of time spent interacting with a generalization peer. The total (hashed plus clear) bar graph represents the total amount of time the participant spent engaged in interactions with generalization and/or training peers. Those bar graphs that show an overlap indicate the amount of time the participant spent engaged in a three-way interaction with both training and generalization peers. Follow-up probes were conducted at 1-week intervals. "A" indicates absence of participant.

high-*p* requests were removed from both settings, Max's rate of initiations averaged 0.4 per minute, and ongoing interactions averaged 41.5%. Max's unprompted initiations to generalization peers ranged from 0.4 to 1.2 per minute, and interactions ranged from 7% to 56% of the total time observed. Tim's unprompted initiations and interactions to training peers remained at increased levels ranging from 0.4 to 0.8 initiations per minute, and interactions ranged from 20% to 89% of the total time observed. Moreover, unprompted initiations to generalization peers remained high, ranging from 0.3 to 0.9 initiations per minute, and continued interactions lasted 16% to 70% of the time observed. Alan's initiations to training peers ranged from 0.2 to 0.7 per minute, and interactions ranged from 30% to 56% of the observed time. Alan's rate of initiations to generalization peers during this phase ranged from 0.1 to 0.8 per minute. His extended interactions during these sessions ranged from 11% to 42% of the total time available.

Follow-up. Social behavior for all participants toward training and generalization peers in the non-training setting was assessed after continuous data collection had ceased. Max continued to initiate (range, 0.4 to 0.6 per minute) and interact (range, 21% to 79%) with training peers. Initiations from Max to generalization peers ranged from 0.4 to 0.7 per minute, and extended interactions ranged from 18% to 41%. For Tim, follow-up probes collected in the nontraining setting resulted in continued levels of initiations to training peers (range, 0.4 to 0.8 per minute), with ongoing interactions ranging from 16% to 60% of the total 10-min session. Unprompted initiations from Tim to generalization peers ranged from 0.6 to 0.8, and interactions ranged from 29% to 51% of the time observed. Follow-up probes for Alan showed maintained levels of both initiations (range, 0.1 to 0.7 per minute) and interactions (range, 3% to 51%) to training peers, as well as initiations ranging from 0.1 to 0.6 per minute and interactions observed from 10% to 60% of the total time with generalization peers.

Undesirable Social Behavior

Throughout the study, there were few occurrences of undesirable social behavior. Undesirable

initiations exhibited by Max consisted of taking a toy away from a training peer and crying and kicking when requested to share the Legos® with the other students. Tim, on the other hand, displayed more undesirable initiations. Two undesirable initiations to training peers following a prompt occurred during both baseline and intervention. Unprompted undesirable social initiations occurred three times during one session in both baseline and intervention. Each of these initiations occurred when Tim interrupted a game by disrupting the activity or stealing the toy. In the nontraining setting, Tim exhibited two occurrences of undesirable social initiations. Undesirable initiations for Alan typically were characteristic of overstimulation in which he grabbed a peer or his or her shirt, pinched or slapped, and said "hug" or "Do you need a hug?" Three separate initiations occurred with both training and generalization peers while in the training setting.

Interactions from Peers Without Disabilities

The mean rate of peer initiations for Max increased during the study, averaging the normative rate of initiations in some conditions. This increase occurred as the interactions between the students increased. For Tim and Alan, the average peer initiation decreased slightly as the peers without disabilities became accustomed to the "rules." Importantly, the target students' responses to peer initiations showed sharp increases during the study. This was seen in both the training and nontraining settings. These data are summarized in Table 3.

DISCUSSION

The results of this study support existing research demonstrating that simply having access to socially active peers or social environments does not insure that withdrawn children with disabilities will interact. All students in this study had access to socially active peers and environments, but baseline data did not indicate socially active participants. This study also expands the high-*p* request research and the social-skills literature by demonstrating that high-*p* requests increased students' responsiveness to low-*p* requests to initiate social behavior. Ad-

Table 3
Peer Initiations to Participants

To:	Baseline	High- <i>p</i> intervention	Prompt removal	Generalization
Max				
<i>M</i> peer initiation	0.06	0.14	0.2	0.17
Range (per day)	0–0.1	0–0.5	0–0.5	0–0.7
% of Max's responsiveness	25	50	62	54
Tim				
<i>M</i> peer initiation	0.23	0.21	0.1	0.11
Range (per day)	0–0.4	0–0.6	0–0.4	0–0.7
% of Tim's responsiveness	40	41	62	50
Alan				
<i>M</i> peer initiation	0.23	0.13	0.16	0.12
Range (per day)	0–0.7	0–0.5	0–0.5	0–0.9
% of Alan's responsiveness	11	21	63	81

ditionally, increases in the students' initiations exposed them to natural reinforcers that may account for increased duration of the ongoing interactions. We also observed generalized unprompted initiations and extended interactions to the training peers, as well as to peers who were not involved in the training procedure. Finally, the results showed generalized unprompted initiations and interactions in a second nontraining setting. The students maintained or increased their levels of initiations and interactions with peers after all prompts were removed from both settings.

The high-*p* sequence increased the responsiveness of all 3 children to low-*p* requests; this resulted in an increase in the rate of prompted social initiations. However, during the intervention, unprompted interactions increased only slightly. When the prompts were removed, social behavior increased to a rate comparable to or higher than the students' prompted social behavior. The prompted interactions during intervention may have prevented increases in the unprompted interactions due to the time the children engaged in prompted interactions. That is, when the low-*p* prompts were removed, the participants simply had more time to produce unprompted interactions, as shown in previous studies (Shores, Hester, & Strain, 1976; Strain & Fox, 1981a).

Social behavior directed to peers not involved in the intervention did not occur immediately. How-

ever, when the target students did begin to interact with the generalization peers, they spent approximately equal time with both training and generalization peers. Generalized responding to low-*p* requests (i.e., prompted initiations) from the training setting to the nontraining setting was delayed somewhat, but continued to increase throughout the intervention phase for all participants. The presence of social behavior in the nontraining setting in the absence of the high-*p* intervention is considered to be across-setting generalization. Although not specifically quantified in this study, several programmatic tactics (i.e., common stimuli, multiple exemplars, and natural reinforcers) can be hypothesized to have promoted generalized responding in the nontraining setting (Stokes & Baer, 1977).

However, this type of across-setting generalization may not actually reflect generalization across nontraining settings. For example, given the results in the training setting, it is possible that peers, who were present in both settings, served as the discriminative stimuli for the social behavior in the nontraining setting. This, rather than other environmental stimuli (e.g., same toys and materials, interventionist, etc.), may have produced changes in the social interactions in the nontraining setting. However, because specific tests of generalization were not conducted in this study, it is difficult to determine whether it was the participants responding to peers or the participants responding to a

combination of irrelevant stimuli (Halle & Holt, 1991).

In examining other aspects of the participants' unprompted social behavior, the delay in Alan's unprompted interactions in the nontraining setting, compared to Max and Tim, may have been due partly to the size of the room and playground in the training versus nontraining settings. Alan's two settings were substantially larger than the spaces used for Max and Tim. The smaller play areas and presence of additional nontraining peers available in the training room may have facilitated unprompted interactions for Max and Tim, whereas the larger play space in the nontraining settings (i.e., playground and larger nontraining room) inhibited Alan's unprompted social interactions, consistent with the spatial density findings of Brown, Fox, and Brady (1987). Unfortunately, due to the applied nature and setting of this study, we did not control for density effects. In addition, a second limitation of this study concerns a minor compromise in the design. Baseline conditions had been initiated for 3 participants when the 3rd participant moved out of state. Therefore, it was necessary for us to delay data collection for Alan, the new 3rd participant.

This study extends and supports at least two bodies of research—high-*p* requests and social-skills training. Research on the high-*p* request sequence is still in the initial stages of methodological and conceptual expansion. One theory of the effectiveness of this procedure can be illustrated by drawing a parallel between the properties of physical momentum when objects in motion are under an environmental challenge and the analogue of a behavior's momentum when behavior is under an environmental challenge (Nevin, Mandell, & Atak, 1983). For example, Nevin and his colleagues showed that a behavior's momentum is the product of response rate (behavioral velocity) and the resistance of that response rate to change (behavioral mass) when challenged by an outside force. In a more recent study, Nevin, Tota, Torquato, and Shull (1990) showed that response rate is a function of the response–reinforcer contingencies; thus, increases in contingent reinforcement increase re-

sponse rate. In addition, they showed that the resistance of a response to change is a function of stimulus–reinforcer contingencies. By extrapolation, the high-*p* sequence may increase (a) the rate of stimulus–reinforcer contingencies by correlating frequent requests with a high rate of reinforcement and (b) the rate of response–reinforcer contingencies by delivering praise (i.e., reinforcement) for the performance of the high-*p* requests. The increases in the response rate and the resistance of that response rate to change created by the high-*p* sequence are the behavior's "momentum" that is likely to persist during the environmental challenge (i.e., to a low-*p* request).

Horner *et al.* (1991) and Mace *et al.* (1988) suggested that, when used in applied settings, repeated trials of reinforced responses from one response class increase the probability that a target response in the same response class, which is not likely to occur, will be performed. The present results indicate the high-*p* request sequence increased the children's compliance to the interventionist's requests to extend a social bid to a peer. That is, the high-*p* requests, although all related to play materials or social bids, were requests for the child to engage in a task in which he was not currently engaged (i.e., the response class of compliance). The low-*p* requests were also requests for the child to engage in an activity in which he was not currently participating (i.e., extending a social initiation). In this study, increasing the child's response to the target request (i.e., compliance) in turn increased the child's prompted social initiations.

Although our results indicate that the high-*p* requests increased appropriate responding to low-*p* requests, it is unclear exactly what maintained the unprompted social initiations exhibited by the children. There are several plausible, and perhaps complementary, hypotheses for the maintenance of the social initiations. First, basic behavioral momentum research correlates different response and reinforcement rates with distinct stimuli. However, in most applied studies, this stimulus is the verbal request to perform an activity. However, it is unclear as to whether or not the discriminative stimulus is in fact

the verbal request or some other aspect of the environment present when the request is given (e.g., activity materials, teacher) (Halle & Spradlin, 1993). If the correlated stimulus complex is broader than the specific request, the momentum of social initiations may continue in the absence of specific requests. Second, increasing compliance to low-*p* requests provided the children with the opportunity to sample social initiations. These initiations may have been positively reinforced by peer responses to the initiations, thereby expanding the response class of social behavior. Finally, as with most social-interaction studies, we assumed that children with disabilities often avoid social interactions. From a negative reinforcement paradigm, it is possible that the history of social initiations for some children has been punished. For example, on the occasion of attempting to share a toy, the child may lose access to that toy, get hit with the toy, or perhaps go unnoticed. All of these outcomes might decrease the probability that the child will engage in extending a social bid. However, by combining the increases in responses (i.e., extending a social bid) and training the peers to recognize social initiations, we reduced possible aversive contingencies for interaction, thus increasing the probability that the child would continue to extend social initiations.

This study also has implications for research on increasing social skills in children with severe disabilities. As stated earlier, three strategies (adult-mediated prompts, peer-mediated activities, and affection activities) have typically been used to increase students' social interactions. This study provides another effective strategy—high-*p* requests—to this pool of tactics. In this research, the high-*p* request sequence was used to produce prompted initiations, and the reciprocal responding of the peers' interactions may have "trapped" the participants' social responding (Stokes & Baer, 1976), resulting in the production and short-term maintenance of social initiation and interaction skills. The performance of the low-*p* request (i.e., social initiation) became the stimulus or the contact point by which continuing reciprocal interactions occurred. Stokes and Baer (1976) have noted that, to obtain generalized and durable behavior change,

children must be taught to exhibit behaviors that will be reinforced by peers. The use of the high-*p* sequence in this study helped the target children to produce these behaviors, thus leading to durable social initiations and interactions between students with and without disabilities.

The results of this study generate several questions that have implications for future research. A logical extension of the current study would be to investigate whether high-*p* requests can be used as a peer-mediated tactic to increase social interactions. This differs from the current study in that the high-*p* sequence would be delivered by peers without disabilities (rather than by an adult). Peer-mediated tactics have increased the generalization of new social-interaction skills to mainstreamed settings when normally developing children were taught to promote the generalization of social skills (Odom & McEvoy, 1988). Future studies might reflect and extend the diversity of adult- and peer-mediated tactics. Finally, as high-*p* requests research expands into other applied domains (e.g., the communication outcomes in the Sanchez-Fort et al., 1992, study), there are many opportunities for further investigations. For example, it is possible that high-*p* requests embedded into a more functional social-interaction sequence could increase the motor skills, self-help skills, or a host of other behaviors, activities, or routines of young children with disabilities (Davis & Brady, 1993).

In conclusion, this study suggests that the high-*p* request sequence is an effective technique to increase the responsiveness of students with severe disabilities to low-*p* requests to initiate interactions with peers. In addition, the results support the use of the high-*p* request sequence in combination with various generalization tactics (i.e., common stimuli, multiple exemplars, and natural contingencies) as a package that facilitates the generalization of social skills to peers not involved in high-*p* training and in settings other than experimental training areas. More importantly, the practical implications of the high-*p* sequence are evident in that it (a) does not require extra materials to obtain the desired behavior change, (b) is not aversive to the target student or individual, (c) is a positive antecedent

technique to increase skills, and (d) is easy for a teacher, aide, or parent to implement. In light of these implications, educators, parents, and service providers have been provided with yet another effective strategy to help students achieve their educational goals.

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