A Staff-Training Program to Increase Spontaneous Vocal Requests in Children With Autism

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This study evaluated a staff-training and feedback program to increase (a) staff use of naturalistic language training techniques, and (b) child production of spontaneous vocal requests in a school setting for young children with autism. Training was conducted in integrated preschool centers and in an art group. The results revealed that the training and feedback procedure was successful in increasing staff use of naturalistic language training techniques. Further, these increased strategies were associated with corresponding increases in spontaneous vocal requests for all children during embedded training and ongoing feedback conditions. In addition, probes collected by an unobtrusive observer revealed durability of child requesting when staff feedback was discontinued. Social validity measures from front-line staff regarding the intervention revealed positive ratings. The results are discussed in relation to the continued search for effective service-delivery systems to improve communication for children with autism in the public school setting.

Many young children with autism exhibit a profound lack of spontaneous initiation of appropriate requesting (Carr & Kologinsky, 1983; Duffy & Healy, 2011; Woods & Wetherby, 2003). Requesting is an essential communicative function, and not being able to do so appropriately can lead to tantrums and other problem behaviors in these children (e.g., Carr & Durand, 1985; Dyer, 1993; Mancil, Conroy & Hayden, 2009; Sundberg, 2008; Tiger, Hanley, & Bruzek, 2008).

Naturalistic training strategies shown to be effective in increasing spontaneous requesting for children with autism include time delay (Carbone, Sweeney-Kerwin, Attanasio, & Kaspar, 2010; Charlop, Schreibman & Thibodeau, 1985; Halle, Marshall, & Spradlin, 1979), incidental teaching (Hart & Risley, 1975, 2000), interrupted chain procedures (Albert, Carbone, Murray, Hagerty, & Sweeney-Kerwin, 2012, and providing opportunities for social control with choice and preference (Bourret, Vollmer & Rapp, 2004; Dyer, 1989; O'Reilly et al., 2012; Peck, 1985). These strategies generally involve presenting choices of preferred items. If the child does not demonstrate the targeted request, the staff member provides a prompt. Requests are then reinforced through providing contingent access to the selected item.

Another naturalistic language training technique that capitalizes on embedding language training in naturalistic context is pivotal response training (Koegel & Koegel, 2006). Specifically, language training is embedded in the context of a play interaction, where the therapist and child take turns with preferred materials that are age-appropriate and found in the natural environment. In addition, stimulus items are selected *during* the session if they have a high interest value and provide naturally reinforcing consequences for each particular child. To increase motivation, opportunities for child choice with the stimulus items are made available within the sessions.

For children with autism to receive maximum benefit from intervention in school settings, it is important that all staff be trained to implement evidenced-based communication training techniques throughout the day. This is particularly critical for these children, because therapeutic gains in isolated settings are unlikely to generalize to nontraining situations (Dyer, Williams, & Luce, 1991; Harris, 1975). The National Research Council (2001) discusses the urgent concern for staff training efforts in this area due to the fact that personnel preparation remains one of the weakest elements for effective programming for children with autism. The

Council emphasizes the critical need for training according to the same principles that are used in teaching their students, with multiple exposures, opportunities to practice with feedback, and active involvement in learning (Petscher & Bailey, 2006).

The effectiveness of staff training on spontaneous requests for youth with autism has been shown in a number of studies. Staff was trained to use incidental teaching by Shepis et al. (1982) to increase spontaneous requesting with sign language in a residential treatment center and by MacDuff, Krantz, MacDuff, and McClannahan (1988) to increase initiations in a community-based group home. Similarly, Dyer, Williams, and Luce (1991) trained therapists to implement naturalistic language training procedures, including preference and choice, time delay and incidental teaching to increase spontaneous requesting with these students in classrooms in a private residential treatment program. More recently, an intensive university-based summer training program resulted in an increase in teacher implementation of incidental teaching (Lerman, Vondread, Addison, & Kuhn, 2004), and a brief staff-training procedure resulted in instructors' use of incidental teaching and increases of students' initiation in classroom settings (Ryan, Hemmes, Sturmey, Jacobs, & Grommet, 2007). In these studies, modeling, role-playing, and performance feedback were used as strategies to improve staff's use of language training procedures.

While the staff-training studies described above produced positive results, they had a number of methodological limitations. First, in all of the studies, non-vocal communicative behaviors, such as touching a stimulus, picking up a stimulus, reaching for a stimulus, and signing for a stimulus, were included in the definitions of communicative initiation, and there was no differentiation between nonverbal initiations and vocal requests. Given the difficulty of producing speech by many children with autism, studies designed to isolate the effectiveness of naturalistic language training on this specific behavior are necessary. Second, communication opportunities in these studies were highly contrived. That is, staff blocked access to preferred items and then saliently presented these items to the child with no ver-

bal cue, providing a silent pause before prompting the request. While this was effective in teaching the children to request in the presence of preferred material, the procedure is unnatural and not seen in typical educational settings. Third, in all but one of the staff training studies, there were problems in the time-series analysis. Specifically, in the MacDuff et al. (1988) and Dyer et al. (1991) studies, global evaluation data of child initiations were provided in terms of total frequency and/or means across the entire condition. Additional time-series analysis is needed to validate and develop a strong evidence base for these practices in special education (Horner et al., 2005). Another design problem in the Lerman et al. (2004) study was that baseline data on teacher behavior was collected during role-play sessions rather than during teaching sessions with the children, making comparisons of pre- and post-training performance difficult.

In addition to methodological limitations, there is need to disseminate these procedures into regular school settings. That is, the interventions discussed above took place in residential treatment settings, private treatment facilities, or university-based settings. In these settings, relatively labor-intensive (and therefore costly) data-collection systems were used to monitor teacher and student performance, and typically involved the use of videotapes that were scored on a trial-by-trial or interval-by-interval basis after the session. Thus, the feasibility of transferring these complex procedures into public school settings is questionable (Lerman, Tetreault, Hovanetz, Strobel, & Garro, 2008). These problems are particularly pronounced when the experimenters were present during maintenance observations and questions regarding long-term maintenance of effects in the absence of observers remain.

Finally, in the majority of the staff-training studies reviewed above, the context for the incidental teaching episode was through arrangement of materials that were preselected before the session by the experimenter, and the staff-child interactions took place in relatively controlled low-distraction settings outside of the context of a regularly scheduled day in a public school. The need to extend these controlled research studies by embed-

ding training and supervision in the context of existing activities during the child's regular preschool day was discussed by Shepis, Reid, Ownby, and Parsons (2001). These authors argue that embedded teaching increases teaching opportunities, minimizes disruption in classroom activities, and enhances skill generalization.

Overall, the literature suggests that there is a need for evidenced-based strategies that can be implemented in school-based settings to increase communication for young children with autism. In addition, staff in our school had received some training in naturalistic language training techniques, observations revealed that they would implement these strategies only for short "programs" in the child's treatment cubicles in the special education classrooms. Creation of ongoing opportunities for the children to request throughout the day was not occurring, and the children were not exhibiting generalized spontaneous vocal requesting behavior across many of the school settings. Therefore, this purpose of the present experiment was to address the above-described limitations through an intervention that (a) evaluates the effects of staff-training and feedback, and (b) evaluates a naturalistic intervention to increase spontaneous vocal requests.

Method

Participants and Setting

Child Participants. Three children, two males and one female, participated in this study. Paul, an 8-year-old boy, Alex, a 4-year-old boy, and Annie, a 4-year-old girl, were diagnosed with autism by a licensed psychologist independent of their current educational facility. Spontaneous requesting was determined to be a communication need by each child's speech and language pathologist (SLP), and was targeted on their Individualized Education Plans. (See Table 1 for standardized test results.)

Paul's strengths were identifying common items by feature, function, and class, and following one-step directions related to his classroom routine. Expressively, Paul's language was characterized by use of single words or short phrases that served requesting, labeling, and greeting functions.

Alex's strengths included labeling, imitating play sequences, imitating CVCV words (e.g., "mama"), and spontaneously repeating words by others. Expressively, one-to-three word utterances that served requesting, labeling, greeting, and protesting functions characterized Alex's language.

Annie's strengths included receptive identification of familiar objects, imitation of one-word utterances, and requesting using the Picture Exchange Communication System (PECS; Bondy & Frost, 2003). When exchanging pictures, Annie had also started to vocally request with one-word approximations. Expressively, Annie's vocal language was characterized by one-word utterances that served primarily requesting and labeling functions.

Alex and Annie were selected for the current study because their teachers were concerned that the gains made in spontaneous requesting in the low-distraction, highly structured treatment cubicles in their special education classroom had not generalized to the integrated preschool centers. Paul was selected due to similar concerns. He had learned to spontaneously request in his special education cubicle, but his teacher reported that he remained silent in small group settings, especially art group, where he engaged in art projects with three to five same-age peers diagnosed with developmental disabilities. The nature of this type of group instruction required fine motor skills that were challenging to Paul, such as cutting with scissors or using glue. These activities did not appear to be preferred to Paul, due to the observation that he never engaged with the materials without being prompted, nor did he readily reach for the materials, resist their removal, or display positive affect while completing projects. Therefore, strategies were investigated to increase requesting for these items that were not highly preferred.

Instructor Qualifications. At the school, all children received individualized instruction from at least 3–5 trained front-line staff, whose job title was associate instructor (AI). These AIs provided instruction to each child in an individualized treatment cubicle for the acquisition of individual skills, and then accompanied them into more naturalistic preschool centers and small group settings for generalization of skills. Each of the 13 BA-level AIs who participated in this study were regular

Table 1. Naturalistic Language Training Procedures

Preference Assessment

1. Introduce objects one by one and demonstrate how they can be manipulated.
2. Give the child the item, and allow the child to manipulate the items for 15 seconds without being prompted.
3. Attempt to remove the item and score a (+) if the child resists removal.
4. Place the item one foot away.
5. If the child requests for the item by reaching or asking for it, allow access to the item for 10–20 seconds.
6. Preferred items are those where the child demonstrate three of the following behaviors:
 - a. Manipulates item for more than 15 seconds without being prompted
 - b. Resists removal of the item
 - c. Reaches for the item
 - d. Exhibits positive affect while playing with the item.

Choice

1. Allow the child to choose one of the preferred items from preference assessment.
2. Initial Errorless Teaching
3. Engage in play with the item with the child.
4. After 10–20 seconds of child play, *take a turn* with the item, and then play with it for 5–10 seconds. Pause.
5. When the child reaches for the item, conduct *incidental teaching* and use *time delay prompting*. Hold up the item within the child's vision but just out of reach, and look at the child expectantly.
6. Immediately model the request for the child to imitate (e.g., "I want doll!").
7. After the child imitates the model, give the child the item.
8. Enthusiastically repeat the name of the preferred item (e.g., "Doll!") after giving the child the item.
9. If the child looks "bored" with the activity *incorporate the child's preference*. Present new toys for the child to choose. Behaviors indicative of boredom are looking away from the activity, asking for something else, flat facial affect, self-stimulation, or stopping the activity.

Prompt Fading Procedure

1. After the child imitates the model prompt correctly for 2–3 trials, fade the 0 second vocal model.
2. Present the natural cue of playing with the item. If the child makes an unprompted spontaneous vocal request using the targeted utterance, give the child the item.
3. If the child initiates a request, but does not use the targeted utterance, prompt an elaboration using the time delay.
 - a. *Time delay*: Hold the item in front of the child, look expectantly, and provide the child with a 3–5 second interval (time delay) in which to produce the vocal request. If the child does not vocally request for the item, prompt by providing verbal model of the request.
 - b. When the child imitates the model, allow the child to play briefly with the item, and then retrieve the item, and present another time delay.
 - c. If the child responds correctly to the second presentation of the preferred item, the child receives the preferred item.
 - d. *Fade time delay*: Over successive trials, gradually move the item from holding it in a salient position in front of child, to the more natural position in play (e.g., on the table or in your hand).
4. Provide multiple (10–20) opportunities with a quick instructional pace.

employees of the school and had received training to implement evidenced-based interventions for students with autism spectrum disorders (ASD). Specifically, staff attended a 2-day in-service training on fundamental principles and procedures for teaching children with ASD using behavioral intervention procedures. In addition, staff had worked under close supervision of a Board Certified Behavior Analyst® (BCBA) for 3 months to ensure that interventions were implemented correctly. During this preliminary general training, staff learned core competencies, including how to correctly implement discrete trials, preference assessments, errorless teaching, prompt fading, and behavior support procedures. These skills were trained through modeling, role-playing, and in vivo feedback until mastery was achieved on competency-based checklists. In addition, staff was required to pass examinations indicating mastery of eight core readings in evidenced-based treatment for children with autism (Bondy & Frost, 2003; Demchak & Bossert, 2005; Dyer, 1993; Dyer, 2005; Dyer & Luce, 2005; Koegel & Schreibman, 1982; Leaf & McEachin, 1999; Luce & Christian, 1981).

The AIs had also passed competencies delivered by their supervising certified special education teacher in naturalistic language training techniques to prompt and expand language, including preference and choice, mand model, time delay, and incidental teaching (cf. Dyer & Luce, 2005). While the staff passed the competencies, they failed to generalize the skills from the special education self-contained classroom to the integrated preschool centers and small group settings, including art group.

Settings and Materials. The participants attended a full-day public intensive behavioral intervention school for children with ASD. The program provided intervention across multiple domains (e.g., communication, cognitive, and motor skills).

To increase generality of the study, this intervention was conducted in two settings. Specifically for Annie and Alex, requesting was targeted in an integrated preschool center and for Paul, a small art group. In the preschool, Annie and Alex played at centers with age appropriate toys (e.g., babies, kitchen, blocks, sensory table). Natural items found in the preschool were used

to assess preference and reinforce requests. Paul's requesting was conducted during art group, which took place at a horseshoe-shaped table in his regular classroom.

Staff Training on Naturalistic Language Training Techniques

Dependent Variable-Staff Behavior. In baseline, embedded training, and ongoing feedback conditions, 5-minute observations were rated for six attributes based on the descriptions of naturalistic language training techniques (Dyer & Luce, 2005; Halle et al., 1979; Hart & Risley, 1975; Koegel & Koegel, 2006). These included: (a) incorporating choices; (b) using time delay; (c) fading the time delay; (d) using incidental teaching; (e) prompting the appropriate language target; and (f) incorporating preferences. A simplified data collection system was developed based on guidelines developed by Lerman et al. (2008). Specifically, each skill component was scored as correct or incorrect based on the teacher's performance of the entire session. Thus, a component was scored as correct only if it was performed correctly every time it was used during the 5-minute observation. If a component was used incorrectly at any point during the session, it was scored as incorrect. If it was not used, the data sheet was left blank for that component. Observers used the following definitions for each of the natural language training techniques, and scored whether the staff correctly:

Incorporated choices. The child was presented a visual array of 2–3 materials and provided instruction to choose an item. Clear options, such as “Do you want to play with *x* or *y*?” were scored as correct. Choices provided in the context of open-ended questions like: “What do you want to play with?” Or a yes/no question like: “Do you want juice?” were not scored as correct.

Used time delay. The AI held a preferred item in front of the child, looked expectantly, and provided the child with a 3–5 second interval in which to produce the vocal request. If the child did not vocally request the item, the AI prompted by providing verbal model of the request. When the child imitated the model, the AI allowed the child to play briefly with the item and then retrieved the item and presented another time delay. If

the child responded correctly to the second presentation of the preferred item, the child received the preferred item.

Faded the time delay. Over successive trials, the AI gradually moved the preferred item from holding it in a salient position in front of the child to the more natural position in play or other activity.

Used incidental teaching. When the child initiated an appropriate communicative response that required further elaboration, the AI prompted the elaborated response for the child. Initiations could be nonvocal (e.g., reaching for the preferred item) or gestural (e.g., pointing to it without reaching) or vocal (e.g., the child says “Train,” when their target utterance is “I want train”). After the child initiated, the AI blocked physical access to the desired object or activity and then modeled the elaborated response for the child after a brief time delay. The AI provided the child the item or access to the activity after the child correctly elaborated the response and enthusiastically repeated the name of the item.

Prompting the appropriate language target. The AI prompted child responses that were specified by the experimenters. For example, if the child was required to request with a three-word utterance, the AI did not prompt responses that were less elaborate, such as a one-word utterance.

Incorporating preferences. The child was provided an array of items and activities available for the session. Staff followed the child’s lead by using materials or activities that the child exhibited preference behaviors with, including manipulating item for more than 15 s without being prompted; resisting the removal of the item; reaching for the item and exhibiting positive affect while playing with the item. If the child looked “bored” with the activity or item, staff presented new materials for the child to choose. Behaviors indicative of boredom included looking away from the activity, asking for something else, flat facial affect, self-stimulation, or stopping the activity.

The data were compiled by assigning a “point” for each correct use of one of the above naturalistic language training techniques for the entire observation. If there were non-uses or incorrect uses of the strategy, a point was not assigned. Therefore, the maximum number of points scored for any observation was 6.

Interobserver Agreement-Staff Behavior. The two trainers independently recorded the staff training behavior for 30% of the sessions, selected on a random basis. These observers had experience measuring communicative behavior in a school setting with students diagnosed with ASD. In calculating overall agreement in staff behavior, observers were considered to agree only when they scored the AI performance of each naturalistic language training technique as correct or incorrect throughout the entire 5-minute observation. Point-by-point percentage agreement for staff behavior was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. The percentage agreement for staff behavior was 93% (range, 67% to 100%).

Instructor Training Procedures

The procedures were adopted from Dyer and Luce (2005), and involved individualized staff training in a clinical treatment room and targeted natural settings with ongoing supervision in targeted natural settings. The training was conducted by the first author, who served as the clinical director of the program, and who was also a certified speech and language pathologist (SLP) and BCBA-D®, and the second author, who was a graduate student clinician completing a master of arts in Speech and Language Pathology.

Experimental Design

A multiple baseline design, where the intervention was replicated across children in a time-lagged fashion, was used for the staff that worked with Alex and Annie, and an A-B design was used for Paul (Barlow & Hersen, 1984).

Baseline. During the baseline condition, the staff were observed working with the children in the allocated setting during their regular schedule. In the integrated preschool centers setting, staff worked with Annie and Alex, who were allowed to play in the center that they chose. The AI carried out their regular job responsibility, which was to prompt age-appropriate child-directed play and communication. During art group, the AI was given general instruction to prompt engagement in the art activity and age-appropriate communication by the classroom teacher. At that time,

there were no special instructions or information given to the staff regarding the purpose of the investigation. The classroom staff was accustomed to being observed by support staff on a regular basis and baseline data was collected as unobtrusively as possible during these observations.

Clinic Training. Initial staff training was provided in a small clinical treatment room that contained two tables, four chairs, and a basket with preferred materials and toys. Each AI was trained to implement naturalistic language training procedures, which involved conducting preference assessments (Dyer, 1987) and then engaging in turn-taking play with the preferred toys with the child participant that they worked with in the natural context (i.e., Annie, Paul, or Alex) . A pause would follow the AI’s turn, providing the child an opportunity to request the item. Correct requests were followed by access to the item. A model prompt was provided if the child did not vocalize the correct request. Specific steps used in training are delineated in Table 2.

Using the checklist in Table 2, the trainer provided immediate verbal feedback to the AI on their implementation of *Naturalistic Language Training Procedures*. The trainer modeled the procedures with the child if verbal feedback to the AI was ineffective. The trainer then continued to re-administer the checklist until the AI performed all the above steps correctly. Each of the AIs required a maximum of two sessions to achieve competence on the above steps that were delineated in a checklist format. The AI was then advised to use the training technique in the specified setting to facilitate spontaneous vocal requests.

Embedded Training in Natural Context. During a classroom meeting, the AIs were asked to suggest ideas for how spontaneous vocal requests might be promoted in the targeted natural settings for each child, and the trainers listed each idea produced. If AIs were not able to identify any such ideas, the trainers suggested one or two as examples. This “facilitative” method of a classroom meeting was adapted from Peck, Killen, and Baumgart (1989). Training sessions were then conducted one-to-two times per week in the targeted setting where AIs were taught how to embed opportunities to request in the context of the regular classroom routine.

Table 2. Child Characteristics

	CA	Language Age ^a	MA
Paul	8	5.3	<2.7 ^b
Alex	4	3.5	3.4–5.7
Annie	4	unscorable	2.9 ^c

^a The Peabody Picture Vocabulary Test- 4 (PPVT-4; Dunn & Dunn, 2007)

^b Differential Ability Scales: Second Edition (DAS-II; Elliot, 2006)

^c Leiter International Performance Scale-Revised (Roid & Miller, 1997)

During the staff training for the integrated preschool centers and art group, the trainer provided instruction, modeling, and praise to the AI while working with the child. The trainer noted the frequency of the child’s requests on a feedback sheet, and noted whether each request was spontaneous or prompted. Additionally, the feedback sheet indicated the naturalistic language training techniques used correctly by the AI (see *Dependent Measures* above). The trainer provided verbal feedback at the end of the session and gave a feedback form to both the AI and their supervising teacher. The AIs were also provided with positive feedback in the form of public posting in the child’s classroom, which consisted of praise for the staff efforts as well as graphic displays of the increase in spontaneous vocal requesting. Finally, a celebration with a dessert plate for the AIs was held when the child reached the mastery criterion of five spontaneous vocal requests across three different AIs.

In order to maintain the ease and naturalness of child-directed engagement, the AIs were instructed to embed a requesting opportunity at a rate of approximately one per minute, which was the criterion level set for the training. The AI was taught to follow: (a) the child’s lead by allowing them to play with items of their choosing; (b) block access to the item, hold it saliently in child’s view, and implement a time delay; (c) provide a model of the name of the preferred item if the child did not ask for the item within 3 seconds; and (d) fade the time delay over successive trials by gradually moving the item to a more natural location. For example,

if the child showed an interest in pretend-food items in the preschool center, the AI might set out a picnic and make a sandwich. Then, about every minute, the AI might take a turn building their own sandwich and then would withhold the preferred item, such as lettuce needed to make a sandwich, or a knife to cut the sandwich. These items were not always ones that the child was reaching for, but were related to the preferred activity. The AI reinforced spontaneous vocal requests with immediate access to the items. Similarly, in the art group, the AIs embedded requesting opportunities by having Paul ask for missing items needed to complete the art project. For example, when the teacher told the students to cut the paper, the scissors were placed out of reach, which provided a natural opportunity for Paul to spontaneously request the scissors.

During art group, the materials (e.g., scissors, tape, glue, crayons, etc.) were not as preferred for Paul, and therefore a strategy was implemented where he received access to a preferred activity when he finished his art project. That is, Paul would choose a preferred activity (i.e., the sand table or sensory-movement room) before participating in art group. He was provided with a token for each spontaneous request that occurred during the group. After he had accumulated five tokens, he could have access to his chosen activity.

For Annie and Alex, the AI utilized regular toys found in the preschool centers to assess preference and reinforce vocal requests. In these centers, there were many toys accessible to the child. Thus, when the AI tried to withhold the preferred toy during the time delay, the child would simply reach for another one of the readily available toys in the center to more efficiently access reinforcement, rather than making the effort to vocalize. Therefore, additional modeling by the trainer was necessary to show the staff how to frame the child and preferred toy with their body to block access to other toys during a requesting opportunity.

Additional receptive labeling instruction. During the initial embedded training sessions, Annie often chose items to play with that were not in her vocabulary (e.g., taco). While the AIs were providing models for these items, it was the impression of the team that this vocabulary deficit negatively impacted her ability to spontane-

ously request the items. Therefore, the trainers provided a lesson plan to the AIs to teach these new labels in the self-contained classroom setting using a receptive labeling program.

Ongoing feedback. After the child reached criterion, the observation and feedback sessions were continued once a week. The trainer only provided immediate verbal feedback to AIs and discontinued the distribution of feedback sheets. During these sessions, the trainer targeted skills that were not being performed correctly by the AIs by providing verbal instruction, modeling, and praise.

Maintenance. After a high and steady rate of spontaneous vocal requests was achieved for four to five sessions, the ongoing feedback was removed. While unobtrusive data were collected on the maintenance of child requests by an observer who was normally in the classroom, data were not collected on staff behavior.

Subjective Measures of Social Validity

The AIs were instructed to anonymously rate the intervention according to a 5-point scale, with a score of 1 (*strongly disagree*) to 5 (*strongly agree*) with respect to the following statements:

1. This intervention was successful in improving the child's functional communication.
2. This intervention was successful in improving the child's communication in different locations.
3. This intervention was successful in improving the child's overall problem behaviors.
4. This intervention was easy to implement.

After the ratings were submitted, the ratings were added together and divided by the total number of responses to arrive at a mean rating for each statement.

Child-Focused Intervention to Increase Spontaneous Vocal Requests

Dependent Measure-Child Spontaneous Requesting. Spontaneous vocal requests were targeted exclusive of other nonverbal means of communication, and frequency data on these requests were collected during all of the 5-minute observation sessions during baseline, embedded training, ongoing feedback, and maintenance

conditions. Each vocal request was scored as prompted or spontaneous. Prompted vocal requests were those preceded by a vocal model by the teacher. Spontaneous vocal requests were those that were not preceded by prompts or models within 3 seconds. Annie was required to request with a one-word intelligible utterance, and Alex and Paul were required to request with a minimum of a three-word utterance for a request to be scored.

In order to assess the durability of the intervention on spontaneous requesting, an unobtrusive observer collected data on these behaviors during maintenance observations collected for 2 months after the cessation of staff feedback. The observer who conducted maintenance observations was employed as an SLP-assistant at the educational facility, and was enrolled in a master's degree program in ASD. She was in the child's settings on a regular basis as part of her job responsibilities, and thus, her presence was not necessarily a cue that data was being collected.

Interobserver Agreement-Child Behavior. Interobserver agreement was collected for the frequency count of spontaneous requests recorded for 30% of randomly selected 5-minute sessions. This was calculated by dividing the smaller of the counts by the larger count and multiplying by 100. The percentage agreement for requesting averaged 94% (range, 80% to 100%).

Intervention. Spontaneous vocal requests were targeted for intervention. Children were provided with requesting opportunities that consisted of the staff implementing naturalistic language training procedures including preference and choice, time delay, and incidental teaching (see staff training targets above). Opportunities occurred in the context of turn-taking play activities in the integrated preschool centers for Alex and Annie, and in the context of missing materials during the art group for Paul.

Results

Naturalistic Language Training

The data for the AIs use of naturalistic training techniques is indicated by the triangles in Figure 1. This data shows that all of the staff increased their use of

naturalistic language techniques in their targeted natural locations. The top graph shows the data for the AI's working with Paul and showed that they did not use any naturalistic communication training techniques during baseline sessions in the art group. During embedded training, AIs use of training techniques increased to an average of 3.1 strategies correctly used per session, with a range of 2–5 strategies used correctly during embedded training in the art group. This level increased to an average of 5.25 across sessions during ongoing feedback, with a range of 3–5 techniques used correctly.

The middle and bottom graph show the data for the staff who worked with Alex and Annie in the preschool centers. During the two baseline sessions, the AIs did not use any naturalistic language training techniques. During embedded training in the preschool centers, the AIs implementation of naturalistic language training techniques with Alex increased to an average of 5 per session, with a range of 3–6 techniques used. During ongoing feedback, the AIs use of techniques with Alex averaged 4.5 per session, with a range of 0 to 6 per session. Similar results are shown for the AIs that worked with Annie, whose use of naturalistic language training techniques during embedded training averaged 3.88 per session, with a range of 0–6 techniques used. This average increased to 4.78 per session during ongoing feedback with a range of 0–6 per session.

Child Spontaneous Vocal Requests

The data for the children's spontaneous vocal requests is indicated by the circles in Figure 1. The data shows that the children increased and maintained spontaneous vocal requesting in their targeted natural locations. Paul did not exhibit spontaneous vocal requests during baseline observations in the art group. In the embedded training condition, Paul's level of spontaneous vocal requesting immediately increased to an average of 4.7 spontaneous vocal requests per session, with a range of 2 to 7 requests across training sessions. This level increased to an average of 6.8 requests across sessions during the ongoing feedback condition, with a range of 5 to 8 requests per session. During maintenance, his requesting averaged 3.6 per session, with a range of 2–6 requests across sessions.

Figure 1. Frequency of spontaneous vocal requests (circles) and number of staff members correct use of naturalistic language training techniques (triangles).

During the two baseline sessions, Alex did not exhibit any spontaneous vocal requests. When the embedded training condition was implemented, Alex's target behavior increased to an average of 4.3 spontaneous vocal requests, with a range of 2–7 requests across seven sessions. Once Alex met criteria, ongoing feedback was implemented. For five of the six observation sessions, Alex produced 4 or more spontaneous vocal requests. During maintenance, Alex continued to spontaneously

request slightly above the criterion level of approximately one request per minute.

Figure 1 shows that Annie's production of spontaneous vocal requests was more variable. Annie's level of spontaneous requesting averaged 1.1 per session for the first 10 observations. The arrow indicates the additional receptive label training that Annie received for her preferred items in her special education classroom. After she learned the receptive labels, Annie's spontaneous

vocal requesting immediately increased and she reached criterion within six sessions.

After reaching criteria during embedded training, ongoing feedback was implemented. There was a high degree of variability in spontaneous vocal requests in the first four observations during this condition with data ranging between 0–4 requests. During the last six observations, Annie averaged 5.8 requests per 5-minute observation. The maintenance data shows no requesting was observed during the first observation. These levels increased to an average of 6 spontaneous vocal requests across the last three observations.

Measures of Prompted Requests

Table 3 shows the mean number of prompted and spontaneous vocal requests for all three children. The data represents the mean number of spontaneous vocal requests during the first and last three sessions of intervention and three sessions of maintenance. The data shows that as the intervention progressed, prompted vocal requests decreased for the two children in the preschool centers. For Paul, some prompts continued to be required to request for items that were needed to complete the projects in art group that were less preferred.

Social Validity Measures

Table 4 displays the results of the social validity questionnaire. The average rating scores from the AIs showed that the AIs rated the intervention as effective and easy to implement. The mean ratings on the state-

ment “This intervention was successful in improving the child’s functional communication” were 4.5 for the preschool centers and 4 for the art group. The mean ratings on the statement “This intervention was successful in improving the child’s overall problem behaviors” were 3.2 for the preschool centers, and 3.6 for the art group. The mean ratings on the statement “This intervention was easy to implement” were 4.3 for the preschool centers and 3.6 for the art group. Finally, the mean ratings for the statement “This intervention was successful in improving the child’s communication in different settings” were 4.3 for the preschool centers, and 2.5 for the art group.

Discussion

The results of this study showed that levels of naturalistic training procedures immediately increased during embedded training with the variability of implementation stabilizing in the latter sessions of the ongoing feedback condition. For Paul and Alex, levels of spontaneous requesting increased when staff’s use of naturalistic training increased and the highest and least variable levels of requests also occurred in the latter sessions of intervention. It appears then that when the staff arranged the environment to saliently present preferred or missing materials, and then prompted and reinforced requests, spontaneous vocal requests increased. For Annie, the trend for spontaneous requesting levels only accelerated during naturalistic training after she received additional instruction to label the preferred items.

Table 3. Mean Frequency of Prompted and Spontaneous Vocal Requests

	Intervention: First 3 sessions		Intervention: Last 3 sessions		Maintenance	
	Prompted	Spontaneous	Prompted	Spontaneous	Prompted	Spontaneous
Paul	1.5	5.3	2	4	2	4
Annie	5	1	.5	5.3	1.25	6
Alex	1	2	0	4.75	0	5

These results tie into a growing body of literature that suggests that training staff to arrange the environment to present multiple opportunities to vocally request can directly impact this critical communication skill in children with autism (Charlop-Christy, Carpenter, LeBlanc, & Kellet, 2002; Goldstein, 2002; Jones, Feeley, & Takacs, 2007; Taylor & Harris, 1995). Before the onset of this study, the staff participants had been provided with training to use these procedures in the children’s cubicles in self-contained special education classrooms. However, baseline observations revealed the need for training and ongoing supervision in less structured group activities and integrated preschool centers. Discussions with the staff regarding this issue revealed that they had not implemented the naturalistic procedures because they had “not been told to do so by supervisory staff.” This revealed a problem with the school’s training and supervision procedures before the onset of the study. That is, their supervising behavior analysts provided staff with regular feedback for procedural integrity regarding following written lesson plans but not with feedback regarding ongoing spontaneous

requests across settings. Thus, this information revealed a dilemma in our evidenced-based programming regarding when to tell the staff to “follow the program exactly” and when to provide looser training for following a child’s lead and for generalization, thus necessitating the need for this intervention. After the staff were trained to use these “looser training” procedures, social validity data was collected, and revealed that the staff subjectively perceived the intervention as easy to implement and successful in promoting generalized functional communication. In addition, they agreed that the intervention was also successful in improving overall problem behaviors.

Additional Training Challenges

As discussed in the method section above, additional training challenges occurred when the staff withheld the preferred toys during the time delay. Rather than requesting, the children reached for different toys to more efficiently access reinforcement. Training the staff to place their body between the child and the other toys, or placing the competing toys out of reach, solved

Table 4. The Mean and Range of Responses From the Social Validity Questionnaire

Question	Integrated preschool		Small group settings	
	Mean	Range	Mean	Range
1. This intervention was successful in improving the child’s functional communication.	4.5	3–5	4	2–5
2. This intervention was successful in improving the child’s communication in different locations.	4.3	4–5	2.5	2–3
3. This intervention was successful in improving the child’s overall problem behaviors.	3.2	3–4	3.6	2–5
4. This intervention was easy to implement.	4.3	4–5	3.6	2–4

this problem. An additional training challenge related to child “preference behaviors.” That is, because children with autism will often express their preferences nonverbally, and these preferences continually shift (Dyer, 1989), staff was trained to respond to these changing nonverbal cues as a basis for selection of objects to use for requesting. We observed that some of the more senior AIs responded to more subtle cues of preference than the newer staff members. For example, when Annie was playing with a toy, and her affect flattened, the senior AI immediately responded by providing a choice of new toys. Less experienced staff required more salient expressions of “boredom,” such as pushing a toy away, or failing to respond to prompts for four to five trials before changing toys. We therefore trained newer staff to respond to these more subtle nonverbal behaviors exhibited by the children.

Along these lines, we observed that more senior staff members employed more subtle prompting-fading strategies than those initially trained in the clinical treatment room (see section above on training). That is, if the child did not respond to a time delay when the toy was held up at a 3-foot distance, then over successive trials, they would move the item closer to her by several inches per trial. These refinements in procedures were then communicated to all staff.

In addition to challenges surrounding training, the necessity for teamwork arose. This occurred when Annie did not request during the first ongoing feedback session. Discussion with the team revealed that the behavior analyst had directed the team to take Annie to locations in the preschool that were less preferred in an attempt to increase her tolerance for new experiences. Thus, the new locations did not have any preferred items, and her requesting stopped (and her problem tantrum behavior increased). Consultation by the trainers with the behavior analyst resulted in a modification of this procedure. Annie now shared control in the preschool where she was allowed to choose some centers and the AI chose the others. This resulted in a return to the targeted levels of requesting of approximately one request per minute. Similar problems occurred during Annie’s first maintenance observation, where she did not request, nor did the AI create any requesting opportuni-

ties. In the specific instance observed in this study, supervisors often reported that the particular staff member observed had a chronic problem of not implementing procedures in the absence of supervisory personnel.

Maintenance of Spontaneous Vocal Requests

The children in this study maintained their treatment gains for 2 months after the cessation of ongoing feedback. However, questions need to be answered regarding long-term criteria for this type of intervention. That is, the criteria for this study was a rate of vocal requesting at approximately one per minute, which was reinforced on a dense fixed-ratio (FR1) schedule of reinforcement. These reinforcement rates for requesting have been used in the treatment literature, particularly during functional communication training, where appropriate requesting is reinforced as an alternative to problem behavior that serves a requesting function. However, Hanley, Iwata, and Thompson (2001) asserted that this schedule of reinforcement should be thinned to more practical levels. These authors also suggested providing a signal to indicate delays of reinforcement when these schedules are thinned. This could potentially avoid increases in problem behavior that can occur when reinforcers are not immediately available. In addition to thinning reinforcement rates for requesting, clinical decisions need to be made regarding when and how to shift the emphasis of spontaneous vocal behavior from requesting to serving broader communicative functions throughout the child’s treatment program (A. Bondy, personal communication, November 24, 2008).

Limitations and Considerations for Future Research

There are several limitations to the present study. First, there were no data collected on the fidelity of the staff training procedures. Because trainers in human service agencies may not be well-versed in employing behavioral staff training strategies, written protocols to both guide and score the integrity of these training procedures would be useful to examine in not only in future research (Parsons, Rollyson & Reid, 2011; Sulzer-Azaroff, Dyer, Dupont, & Soucy, 2013), but to be made available to train BCBA supervisors in our school as well as similar programs. Second, the AI

implementation data were collapsed into one measure based on their performance during the entire 5-minute observation, which resulted in a less sensitive dependent variable and masked variability of performance. As discussed in the introduction, data collection systems used in applied practice settings need to be cost-effective and user friendly as there are not as many resources in public schools for complex data systems (Lerman et al., 2008). In the present study, the data collection sheets were also used as feedback sheets with the observer providing photocopies of the sheet to the staff for feedback. Third, there were fewer than three data points in two of the baselines in this study. While adding more data points would have contributed to the experimental rigor of the design, practical and ethical considerations of withholding intervention in a public school setting, as well as the resources required for concurrent measurement are issues that need to be weighed when conducting intervention research in applied settings (Cooper, Heron, & Heward, 2007). Fourth, during the maintenance condition, while the child requesting data was collected by an unobtrusive observer, staff use of naturalistic training techniques was not measured. Data collected on the AIs correct use of each naturalistic training technique would have required more overt and sustained observation of each staff member, and may have contributed to staff reactivity.

The results of this study revealed a number of areas that could be explored in future research. The first relates to the increase in Annie's spontaneous requesting after additional receptive labeling training. An interesting area of investigation would be the possible facilitative effects of teaching receptive labels in a discrete trial instructional context on the fluency of spontaneous requesting in more loosely controlled contexts.

The second area relates to the nature of the relationship of the trainers to the front-line staff. That is, the supervisory role of the clinical director may have influenced the compliance of the staff to the training procedures. Results of many studies suggest that feedback is significantly more effective when provided by supervisory personnel than by an outside trainer (cf. Luce & Dyer, 1995). It would therefore be interesting to exam-

ine whether these types of results would be obtained with trainers who were in a consultative, rather than supervisory relationship with the front-line staff.

A third consideration for future research relates to the stimuli required for requesting. In this study, spontaneous requesting increased in response to contrived situations consisting of the staff withholding preferred items or placing them out of reach. Future research needs to examine how to extend this technology to increase child requesting outside of these contrived situations, that is, to more "natural" cues, such as when a child desires an item when it is out of view, or to situations where a child needs a missing item that is not present.

A final area involves the need to develop an evidence base for the best service-delivery models for communication intervention, that is, the best configuration of resources, intervention, settings, roles of professionals, and intensity of services to facilitate development of spontaneous communication for these students. In their review of the research, Cirrin et al. (2010) found a limited number of studies directly examining the differential effectiveness of various service-delivery models for school-based children. Their findings revealed some evidence suggesting that classroom-based direct services are at least as effective as more traditional pull out services for elementary school-aged children. While there were some studies in their review showing the successful implementation of natural language procedures by classroom staff and improved communication skills of the children with autism in their review (e.g., Dyer et al., 1991; Howlin, Gordon, Pasco, Wade, & Charman, 2007; Smith & Camerata, 1999), none of these studies directly compared training models. Therefore, future research needs to identify components of optimal models for these children.

Guidelines for Increasing Spontaneous Requests in a School Program

After the data showed that the intervention was effective, the staff of the speech and language department integrated the procedures used in the study into the regular service-delivery program. The following recom-

mendations for practitioners are based on this system:

- Select and operationally define the targeted spontaneous requesting behavior
- Select a context for training in the natural environment that provides natural opportunities for requesting
- Train staff to implement naturalistic communication training procedures including:
 - Incorporating choices and preferences
 - Time delay
 - Incidental teaching
- Provide training across settings, including:
 - a low distraction setting
 - natural classroom settings during ongoing regular instruction
- Program for reinforcers for the children
 - Reinforce requests for preferred items with access to that item
 - When teaching children to request for missing items to complete a task that is not a preferred activity, provide token reinforcement for requests and exchange tokens for a preferred activity
- Provide immediate and delayed feedback to staff and their supervisors on planned observations with a clear form that provides points for naturalistic training procedures correctly implemented
- Meet with staff on a weekly basis to generate ideas for requesting and present data to the team on successes.
- Design and implement data collection systems for staff on data sheets that:
 - Provide naturalistic strategy used
 - Location of targeted intervention
 - Specify operational definitions of prompted and correct responses
- Provide ongoing weekly supervision to staff while they are working with the child.
- Provide ongoing and bidirectional feedback between supervisors and staff regarding challenges to intervention.
- Review data on weekly basis with supervising behavior analysts for troubleshooting and reinforcement of procedures

- Communicate and collaborate with other service-delivery providers to ensure coordination and consistency of service delivery

In summary, these results tie into a growing body of research on spontaneous communication in children with ASD. That is, initial studies conducted in controlled laboratory settings provide robust evidenced-based strategies to increase spontaneous requesting. This study extends these important findings by providing front-line staff and supervisors in school settings with a practical staff-training program to promote this behavior in these children. Indeed, it provides the children with strategies to make their wants and needs known, without depending on others to verbally initiate interactions. As children with autism learn these skills, they can use them to interact with an increasingly wider range of people.

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