The Effects of Pyramidal Training on Staff Behavior and Manding in Children with Autism

By

Darlene Nigro-Bruzzi

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	Dr. Peter Sturmey
Date	Chair of Examining Committee
	Dr. Maureen O'Conner
Date	Executive Officer

Dr. Peter Sturmey

Dr. Bruce L. Brown

Dr. Alicia Alvero
Supervision Committee

THE CITY UNIVERSITY OF NEW YORK

Abstract

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Advisor: Professor Peter Sturmey

The population of children with autism in the public school system is consistently growing yet there is a lack of staff qualified to teach them. Efficient staff training in schools and in the home is necessary to maximize the number of clinicians who can effectively produce child behavior change, while minimizing cost and time to train the staff members. This study evaluated the effects of pyramidal staff training, a train-the-trainer procedure, using behavioral skills training, comprised of instructions, modeling, rehearsal and feedback on 3 supervisors' percentage of staff-training responses, percentage of 3 teacher assistants' teaching responses and percentage of unprompted mands in 6 children with autism spectrum disorders. Behavioral skills training was effective in training 3 supervisors to increase the percentage of correct teacher assistant mand training responses and child unprompted mands. The teacher assistant teaching responses generalized across children. Further, 2 of 3 children generalized responding to untrained stimuli. One teacher assistant required an additional session of feedback to increase her percentage of teaching responses during post training. Pyramidal staff training combined with behavioral skills training was an effective procedure for training staff to teach children with an autism spectrum disorder to mand independently.

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The Effects of Pyramidal Training on Staff Behavior and Manding in Children with Autism

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Manding

Skinner (1957, p. 35) stated that mands comprise a majority of the verbal behavior typically developing young children acquire. In contrast, many children with autism spectrum disorders (ASD) have communication deficits and do not acquire a manding repertoire. Communication deficits among children with autism are often associated with maladaptive behavior (Matson, Boisjoli & Mahan, 2009; Stevenson & Richman, 1978), and this maladaptive behavior, e.g., tantrums for desired items, behavior may serve a similar social function to that produced by appropriate forms of communication (Carr & Durand, 1985; Wacker et al., 2005). For these reasons manding may be a good starting point for language intervention. Bondy and Frost (1994) stated that requesting should be taught first because the response is directly related to the reinforcer, often concrete, and can be learned rapidly.

Given the clinical importance of establishing an appropriate mand repertoire among children with communication deficits, a number of mand training procedures have been developed, including child-initiated procedures, such as incidental teaching (Hart & Risley, 1975) or teacher-initiated procedures, such as the mand model procedure (Rogers-Warren & Warren, 1980), and most recently, trial-based assessments (Bourett, Vollmer and Rapp, 2004). Bourret et al. (2004) stated that although many studies have shown that mand training is effective, experimenters often do not describe the methods used to select and conduct mand training procedures. Therefore, Bourret et al. (2004) empirically

examined the effects of several teaching procedures on manding. The experimenters conducted two studies, where they specified the methods used to select and conduct mand training procedures. Participants were 3 children, aged 6, 14 and 18 years of age, with an ASD and ID's. Experimenters first conducted a stimulus-engagement preference assessment to identify potential reinforcers and met with parents to select the child's topography for manding. Experimenters then conducted a vocal mand assessment, consisting of ten, 1 min trials. In each trial, they introduced least to most restrictive prompting. For example, if no mand occurred after 10 s into the trial, the experimenter provided a non-specific prompt, "If you want this ask me for it". If the child did not respond, experimenters delivered a prompt including the target word 20 s into the trial and delivered a phonemic prompt 30 s into the trial. The authors defined a phonemic prompt as the initial sound of the targeted item, e.g. "CH" for a chip. If the participant said entire targeted word, experimenters reinforced the vocalization and terminated the trial. The vocal assessment results suggested different teaching procedures for all 3 participants, determined by the prompt level that evoked the participants mand. Bourret et al. used prompting and reinforcement to increase manding for the first participant, shaping and stimulus fading for the second participant and a prompt fading procedure for the third participant. After an increase in mands for all three participants, Bourret et al. (2004) concluded that prompting and reinforcement, prompt fading and shaping are three behavior analytic procedures that can be effective in teaching a mand repertoire in children with autism. Initial assessments are imperative to selecting the correct mand training procedure for individuals. Although Bourret et al. (2004) were effective in teaching three children to mand and in detailing a trial-based mand assessment procedure,

experimenters conducted the assessments and mand training procedures, as opposed to the individuals who work with children with and ASD in the field, i.e., teachers and paraprofessionals. Experimenters may want to examine staff training procedures in combination with manding.

Behavioral Skills Training

Efficient staff training is important to maximize the number of people who effectively produce client behavior change while minimizing cost and time. Furthermore, training all staff who interact with children with an ASD will help increase treatment consistency and compliance, therefore increasing probability of behavior change. Behavioral skills training (BST) is a staff training procedures that produces effective and efficient behavior change (Kuhn, Lerman & Vorndran, 2003; Miltenberger, 2001, p. 217). BST is comprised of instructions, modeling, rehearsal and feedback used to teach a specific skill. BST is effective for teaching a wide variety of skills such as abduction-prevention skills to young children (Johnson, Miltenberger & Knudson, 2005), training teachers to implement behavior analytic procedures with children with autism (Lerman, Vorndran, Addison & Contrucci Kuhn, 2004; Sarokoff & Sturmey, 2004), preference assessment implementation (Lavie & Sturmey, 2002) and reducing children's stereotypy during direct instruction (Dib & Sturmey, 2007).

As mentioned above, Lerman, Vorndran, Addison and Contrucci Kuhn (2004) trained teachers to conduct single, paired and multiple preference assessments and to implement direct and incidental teaching with children with autism by using a training package comprised of a 5 day workshop involving lectures, role-play and feedback. Four teachers participated in the study. Lerman et al.'s (2004) procedural steps for incidental

teaching of communicative responses (mands) were: 1) item restricted, 2) wait at least 3 s between prompts, 3) prompts delivered only if the child is showing interest in the item, 4) prompts delivered in correct form and access to item at least 20 s following target response. All of the teachers met criterion for conducting preference assessments during the role-play training and in the classroom; however, two of the children assigned to one teacher and one of the children assigned to a second teacher did not show an increase in communication responses during incidental teaching. The reason for the lack of experimental control may have been that Lerman et al. (2004) did not operationally define the steps involved in obtaining communication responses. A clearer operational analysis of incidental teaching of communicative responses may be necessary to obtain experimental control when training teachers to increase communication responses in children with autism. For example, the authors did not define, "showing interest in the item", and did not specify how long the item should be restricted, thus teachers may have interpreted the phrases differently.

Addressing communicative behavior specifically, Nigro-Bruzzi and Sturmey (in press) used a multiple baseline design across participants to examine the effects of BST on 3 teachers' and 3 speech therapists' implementation of a vocal manding procedure in young children with an autism spectrum disorder. The experimenters used a trial-based procedure, similar to Bourret e al. (2004), and provided a number code for each prompt level which ranged from Level 1 through 5, with Level 1 representing an unprompted mand, 2 representing a mand with a non-specific prompt, 3 representing a mand with a verbal prompt, 4 representing a mand with an imitative prompt and 5 representing an imitative prompt provided, without a child imitation. For 5 of the 6 teachers, during

instructions-only baseline, correct teacher responding ranged between 0% and 65%. Post-training, teacher responding ranged between 75% and 100%. The sixth teacher's correct use of mand training increased throughout baseline and by the end of the study she conducted mand training comparable to the other staff during post-training and was reflected in the child's Level 1 mands. This increase did not coincide with training other staff and so contamination from training other staff was unlikely. The staff member did not have an explanation. Perhaps repeated instructions alone were sufficient to teach her mand training or perhaps she had access to unknown materials. Generalization of staff teaching skills to new locations occurred for all staff. The social validity of this intervention was supported by systematic increases in child Level 1 mands and high social validity ratings from all staff. Interestingly, Nigro-Bruzzi and Sturmey observed that the high number of mand opportunities during baseline did not result in a high number of Level 1 mands. After BST the number of mand opportunities decreased for 3 staff-child dyads, yet the number of unprompted mands increased. This demonstrated that the teaching procedures and not an increase in the number of mand opportunities were responsible for the increase in Level 1 mands.

Although Lerman, Vorndran, Addison and Contrucci Kuhn (2004) and Nigro-Bruzzi and Sturmey (in press) extended and linked the literature on staff training and mand training, they did not specifically address efficiency in staff training. For example, Lerman et al.'s (2004) training procedure consisted of a 17.5 hour training. Although Nigro and Sturmey's (in press) was much shorter, 2.5 hours to train each teacher, it may not be possible for a professional to train each staff member that comes in contact with a

child with an ASD in the field. Research may want to examine a more efficient staff training procedure.

Pyramidal Training

Pyramidal training is a hierarchical procedure where one person trains a second person to implement and train others to conduct specific procedures. Kuhn, Lerman and Vorndran (2003) referred to pyramidal training as a "train-the-trainer" procedure. Pyramidal staff training is effective in teaching behavior reduction procedures (Kuhn et al., 2003; Shore, Iwata, Vollmer, Lerman & Zarcone, 1995), teaching parents to reduce problem behavior (Kuhn et al., 2003; Neef, 1995) and teaching staff members to increase residents' communication and gross motor skills (Page, Iwata & Reid, 1982).

Page et al. (1982) examined the effects of pyramidal staff training in a large residential and outpatient facility. Three supervisors, aged 21 to 24 years and 45 direct care staff members aged 18 to 60 years participated. Four residents with intellectual disabilities (ID) participated, ranging from 3 to 19 years of age. Researchers observed four supervisor responses: use of praise, instructions, direct interaction and staff observation and direct care staff delivery of instructions, prompts and consequences. Researchers observed resident attending, disruption, correct responses, prompted responses and incorrect responses. Observers used partial interval recording to measure the staff and residents behavior. Researchers used a multiple baseline across staff responses (instructions, prompts and consequences) to evaluate the effects of the staff training by supervisors on direct care staff and resident behavior. In the area of communication (vocalizations and receptive instructions), direct care teaching behavior increased from an average of 24% correct to an average of 67% correct across

instructions, prompts and consequences. In the area of gross motor skills (appropriate head control, sitting and standing behavior), direct care teaching behavior increased from an average of 29% correct to an average of 81% correct across instructions, prompts and consequences. Furthermore, there was a corresponding increase in unprompted resident communicative behavior, from an average of 2.6% in baseline to 11.0% in the maintenance phase and in unprompted gross motor skills, an average of 20.5% to 40.0%. The authors concluded that pyramidal staff training was effective and that researchers should examine training staff to teach other responses, such as fine motor skills. The authors also suggest researching a BST component analysis.

There are several limitations to Page et al. (1982). First, training did not have an immediate effect on direct care staff correct teaching responses during communication training. Although it is difficult to determine because data on the graphs were presented as averages across all staff, approximately 20 training sessions were required to achieve 80% correct responses. The averages could have misrepresented some individuals' behavior and the effect may have been inconsistent. Further, 20 or more sessions before observed behavior change may be problematic for the staff and the clients in an applied setting. A more efficient procedure may be necessary. Second, the percent correct teaching behavior during communication training exhibited by direct care staff was variable, even after training. Data often dropped below the 80% correct target.

In a more recent study, Kuhn et al. (2003) used pyramidal training with families of children with problem behavior. There were 12 participants, 3 children and 3 family members for each child, e.g., child 1 and his/her mother, father and grandmother. The 3 children were between 4 and 11 years of age, two of which had ID (Robin and Myron)

and one who displayed hand flapping but was not diagnosed with any developmental disability at the time of the study (Sam). Prior to baseline, experimenters conducted a functional analysis to determine the function of the children's problem behavior and developed interventions. Experimenters identified one family member of each child as the primary caregiver (PC). Kuhn et al. used a non-concurrent multiple baseline design across caregivers, i.e., baseline and training sessions with all PCs before family member exposure to baseline and training conditions. During baseline, the experimenters told the PC to engage in an activity with the child that evoked the problem behavior and to respond to the behavior as they usually did.

After baseline, the experimenters used BST to teach the PC to implement the behavior analytic behavior procedure and to train other family members to conduct the same procedure. The experimenters then instructed the PC to conduct baseline and training with family members. The PCs implemented the training procedure with between 85% and 100% correct responses. The percentage of correct responses during intervention for all PC's increased at the onset of training. Furthermore, the percentage of correct responses increased from baseline for the other four family members at the onset of the training phase. Sam and Myron's target problem responses decreased soon after the PC's and the family members implemented the intervention procedure. Only the third child, Robin, did not show a decrease in problem behavior, despite the increase in correct intervention procedures demonstrated by the family members. The experimenters concluded that pyramidal training was efficient and effective; however, there were three limitations. First, child behavior did not always decrease immediately following a change in caregiver behavior. The authors stated that a lack of immediate behavior

change by the children might lead to non-adherence to treatment plans by the caregivers. Second, some of the caregivers were reluctant to display the skills in the absence of the PC, i.e., Sam's caregivers did not agree to schedule sessions with the experimenters so that the experimenters could measure this. Third, the authors stated that there was a lack of long-term follow up. Shore et al. (1995) found similar results when conducting pyramidal staff training to decrease problem behavior in a state residential facility; however, Shore et al. (1995) were able to conduct follow up measurements. They did observe variability in staff and child responses. In sum, pyramidal training is an effective training procedure for non-communicative behavior.

In an effort to combine pyramidal training with BST and mand training, Schlosser, Walker and Sigafoos (2006) examined the effects of increasing opportunities for requesting on children with developmental disabilities. Using a multiple baseline design, experimenters trained a group of direct care staff, which then trained two more groups of direct care staff. The staff-training portion was a combination of a 3-hour workshop, modified BST and consultation sessions. Requesting opportunities increased from 0 during baseline to a range of 2 to 11 opportunities per session during post training for all three groups. The authors concluded that pyramidal training was effective in training staff members. There were several problems with the Schlosser et al. (2006) study. First, 2 of the 3 children repeatedly served as participants for all three groups of staff members. Second, after the teacher training component the children's mands still required prompts, only three mands in the study were unprompted. Third, generalization was not planned or assessed. Fourth, the staff training was inefficient since consultation sessions were used when BST has been shown to be a more than sufficient training

procedure. Fifth, staff from the second and third groups were only given one training session and no minimum criterion was set for their entrance into post training. As observed by Nigro-Bruzzi and Sturmey (in press), increase in number of mand opportunities alone, does not increase unprompted manding. Therefore, the Schlosser et al. (2006) teaching procedure may have been ineffective.

To summarize, although literature on mand training and staff training has made significant contributions, there are still several issues to be addressed. First, no studies have provided a mand-training task analysis. Second, no studies have combined BST and pyramidal training with mand training and observed an increase in children's unprompted mands. Third, no studies have examined generalization of child mands across items and generalization of teacher-assistant teaching responses across children. Fourth, although training has been shown effective for promoting mand training among staff and parents, it has often required lengthy instructions. The current study aimed to provide an efficient staff training procedure.

Owing to the importance of teaching unprompted mands to children with an ASD and the need for efficient staff training, the current study examined the effects of pyramidal training, using BST on supervisor mand teaching responses, supervisor staff-training responses, staff mand teaching responses and unprompted child mands. Generalization of staff performance across children and generalization of child mands across stimuli was assessed. The study aimed to examine the effects of efficient pyramidal staff training on teacher acquisition of mand teaching responses as opposed to an experimenter-run staff training study. A major goal of the study was to provide a template for the applied field for effective and efficient staff training by providing a staff-

training task analysis and reducing lengthy instructions and training, while simplifying mand training procedures by providing a mand-training task analysis for use in schools and homes.

Method

Participants

Participants included 3 supervisors, 3 teacher assistants, Ms. J, L and D, and 6 children between 3 and 8 years of age with autism spectrum disorders. Two supervisors were lead teachers in a classroom setting and one was an in-home ABA program coordinator. Teacher assistants were NYS licensed teachers or teacher assistants and were untrained in mand training procedures. To participate in the study, the supervisors had to have been previously trained with the manding procedure (Nigro-Bruzzi & Sturmey, in press) and displayed 90% or more of the skills listed in Table 1 during one observation session. To participate in the study, the teacher assistants were required to display 40% or less of the skills listed in Table 1 during the first baseline session. Three children served as participants during baseline, post training and generalization across materials sessions. Three additional children served as participants during generalization across children sessions.

Setting and Stimuli

The experimenter conducted the study in available rooms in the school, i.e., classrooms, conference room and physical therapy gym, or in bedrooms at the children's homes, for staff training, baseline and post-training sessions. In the classrooms, staff sat diagonally across from the students at a child-sized table and chairs. In the physical therapy gym the teacher assistant and student sat at a therapy bench and used child-sized chairs or sat on the floor. In the child's home, the teacher assistant set up materials on the

child's bed or bedroom floor. The teacher assistant and child typically stood during the experiment although child-sized tables and chairs were available. The experimenter recorded sessions using a camcorder and provided the supervisors and teacher assistants with the instructions (Appendix A), manding task analysis (Table 1), a timer, pens, toys and a data sheet (Appendix B). The experimenter traveled to the children's school or home for all sessions. Toys were used as preferred stimuli for mands; see Table 2 for a list of toys. The children did not have access to the toys when they were not participating in the experiment because the experimenter removed all toys used in the study from the school, or locked them in a school cabinet.

Mand Definitions

Words and word approximations made in the presence of target items were accepted as mands in the current study. An approximation of a vocal model included any vocalization from the child that included any combination of vowels and consonants in the word that was modeled by the experimenter. The approximation had to be in the same sequential order as the word, e.g., "buh" or "ook" for book, but not "kob". Experimenters recorded teacher assistant initiated and child initiated mands in the present study. Child initiated mands were scored if the child touched, manded or gestured toward an item after the teacher assistant placed the toys from the preference assessment on the table or floor (step 1 from Table 1). Experimenters scored not applicable for step 2 on Table 1 if the child initiated a mand. If the teacher assistant ignored the mand and asked "find the one you want", the opportunity was still considered child initiated and step 2 was scored as incorrect. Experimenters scored a mand as a teacher assistant initiated

mand if the child did not initiate and the teacher assistant performed step 2 from Table 1, "Find the one you want".

Procedure

Overview. Experimenters used a pyramidal approach, i.e., the experimenter trained 3 supervisors, the 3 supervisors then trained 3 teacher assistants and the teacher assistants then entered post-training sessions with 1 child with an ASD and 1 generalization participant with an ASD. The experiment consisted of: (a) an initial assessment (b) supervisor training and (c) teacher assistant training. The purpose of the initial assessment was to determine if the child participants meet criterion to be in the study and to select stimuli for manding. The purpose of supervisor training was to train the supervisors to conduct BST with the teacher assistants. The purpose of the teacher assistant training was to have the supervisors use BST to train the assistants to conduct mand training.

Initial Assessment. Experimenters assessed young children with autism for vocal imitation and vocal approximations of the experimenter's vocal model. The children had to match a vocalization in response to the experimenter's vocal model. The experimenters defined a match as a vocalization from the child that included a combination of vowels and consonants in the correct sequential order of the word modeled by the experimenter, see definition under mand definitions. The children made at least one vocal approximation of the experimenter's vocal model for all stimuli used in the experiment. Experimenters conducted a stimulus preference assessment prior to the start of baseline to determine the stimuli given to the teacher assistants for their preference assessments. The multiple-stimulus without replacement (MSWO) preference

assessment was based on DeLeon and Iwata's (1996) assessment, for the initial and subsequent preference assessments (see Table 1, steps A-D). For the initial assessment, the experimenter put 7 items on the table, a few inches away from the child. The experimenter told the child to find the one he/she wants. When the child gestured, touched or approximated the name of the item, the experimenter held up the item and modeled the label, up to 3 times with 3 s in between each model. After the third model the experimenter gave the child the item and wrote down the name of the item and the child's closest approximation. The experimenter then removed the item from the child, did not place it back in the array, and started another trial. This continued until the child did not select an item within approximately a minute or until there were no items remaining. The toys the child selected during this assessment were used for the preference assessments with the supervisors and teacher assistants. For the preference assessments with the supervisor and teacher assistants, staff followed steps 1 through 4 on Table 1.

Table 1

Preference Assessment and Mand Training Task Analysis

Preference Assessment

1) Put the toys on the floor or table. Place the toys a few inches apart.

2) Bring the child a few inches away from the toys. Tell the child "get/find/show me/point to the one you want."

3) Place the item the child chooses to the side. Write the name of the toy on the data sheet.

4) Start again with step 2. Continue until all items were selected, or until the child does not select an item after 1 minute.

Mand Training

1) Place the items selected from the preference assessment on the floor, with 1 inch in between each toy.

2) Bring the child a few inches away from the toys. Tell the child "get/find/show me/point to the one you want."

3) (Level 1) When the child touches the object, immediately remove the item from the child's hands and hold it approximately 2 feet in front of the child's face. Wait 3 seconds for the child to mand. Give the child access to the toy for up to 1 minute if the child mands.

4) Write the name of the item on the data sheet and put a check under Level 1.

5) (Level 2) If the child does not mand after 3 seconds, say "what do you want"? If the child says the name of the item, give the child the item for up to 1 minute.

6) Write the name of the item on the data sheet and write level 2 next to the item.

7) (Level 3) If the child does not mand after 3 seconds, give a verbal prompt, (e.g., "Mmm" for a musical toy). If the child repeats, give the child the item for up to 1 minute.

8) Write the name of the item on the data sheet and put a check under Level 3.

9) (Level 4) If the child does not mand after 3 seconds, say "name of the item". You may repeat the name of the item up to 3 times, with 3 sec in between each model. If the child repeats, give the child the item for up to 1 minute.

10) Write the name of the item on the data sheet and put a check under Level 4

11) (Level 5) If the child does not mand after 3 seconds, place the item back in the array.

12) Write the name of the item on the data sheet and put a check under Level 5.

Note. After the child receives reinforcement, start again with step 2.

If the child does not mand after an IM prompt also start again with step 2.

Continue until the experimenter says to stop.

Table 2

Preferred stimuli selected during the Initial Preference Assessment for child participants.

Jack		Lucy		Ginny	
Toy	Mand	Toy	Mand	Toy	Mand
Barney Book	Barney	Tops	Spin	DVD player	Movie
Learn thru Music	Music	Keyboard	Music	Figures/ House	People
Fridge Phonics	Letters	Figures/ House	People	Dora Book	Dora Book
Balls	Ball	DVD player	Movie	Keyboard	Music
Bubbles	Bubble	Cars	Car	Fridge Phonics	Letters
				Cars	Car

Don		Jess		Tony	
Toy	Mand	Toy	Mand	Toy	Mand
Sesame Street Books	Sesame Street Book	Figures/House	People	DVD Player	Movie
Dora Books	Dora Book	Keyboard	Music	Playdoh	Playdoh
Puzzles	Puzzle	Play Food	Food	Tops	Spin
Flash Cards	Card	Blocks	Block	Blocks	Block
				Thomas Tank Book	Thomas Book
				Bob Builder Book	Bob Book

Supervisor Training. Experimenters conducted one BST review session with the supervisors who were previously trained to implement mand training (Table 1). During that session the experimenter provided S^{D}'s to the supervisors, i.e., read instructions (Appendix A) and the manding task analysis (Table 1). The experimenters read the data sheet (Appendix B) and pointed to the line where the supervisors should write the mands and the P or + that the supervisors should circle. The supervisor then watched a previously recorded video of the procedure being implemented correctly. The experimenter and supervisor then role played five prompt levels, 1 through 5, included in the manding task analysis. The experimenter played the role of the child. The experimenter provided feedback on the supervisors performance. Feedback consisted of positive statements such as "you did really good providing a Level 1 prompt before a Level 2 prompt" and corrective statements such as "you omitted prompt Level 3, please include it next time." Following this BST session, the experimenter asked the supervisor to conduct a 15 min mand training session with one of the generalization child participants. If the supervisor scored 90% on the steps from the task analysis during their session they moved on to the next component. If the supervisors did not implement the protocol with 90% accuracy they received one booster BST session with the experimenter followed by a second 15 min mand training session with the child. The supervisor repeated these sessions until they implemented the procedure with 90% accuracy during one 15 min mand training session.

After the supervisor met criterion, the experimenter proceeded to train the supervisors to train the teacher assistants using BST and the 20-step staff-training task analysis (see Table 3). As seen in Table 3, first, the experimenter reviewed the teacher

assistant's baseline performance with the supervisor by showing videotape of the teacher assistants baseline sessions and stating teacher assistants' errors. The experimenter also showed the supervisors the teacher assistants' baseline data sheets. The supervisor made a list of the teacher assistant's correct and incorrect steps from the manding task analysis based on information provided from the experimenter and from watching videotapes from the teacher assistant's baseline sessions. Then the experimenter initiated BST training (Table 3). The experimenter initially role played the teacher assistant and the supervisor role-played themselves and then the part of the child for components 3, 6, 9, 12 and 15. For clarification purposes in this manuscript, the persons' title was stated first and the person they were role playing during the experiment followed in parenthesis. At the start, supervisors gave feedback on the experimenter's (teacher assistant's) baseline performance. Then supervisors read the instructions aloud. Next, the supervisors played a video that showed a model performing all the steps correctly in Table 1. The supervisor then started the role-play portion, where they role played the child. During the preference assessment role play (step 3, Table 3) the supervisor role played the part of the child and took data on the experimenter's (teacher assistant's) behavior during steps 1 through 4 on Table 1. The supervisor gave feedback after they performed step 4. The supervisor then told the experimenter (teacher assistant) to select a prompt level to practice and to begin mand training. Although the experimenter told the supervisor to randomly select a prompt level, the supervisor had to continue prompting until the experimenter (child) manded for an item. Therefore, the supervisor could have selected prompt Level 1, but may have had to continue prompting and score prompt Level 2, 3, 4 or 5 if the experimenter did not respond to prompt Level 1. The supervisor role played the part of

the child during this role play and made attempts to imitate behavior characteristics of the relevant child participant. For example, Ginny frequently grabbed for all items and stared into space, Lucy manded for the movie repeatedly and Jack engaged in self-stimulatory behavior. The experimenter and supervisor repeated this role play 5 times, which allowed the experimenter and supervisor to role play each prompt level (Levels 1-5). The supervisor (child) manded with a different prompt level for each role play and did not inform the experimenter (teacher assistant) of which prompt level they would respond to in advance. After each role play the supervisor collected data on the experimenter's (teacher assistant's) performance by using the check list (see Appendix C).

Table 3

Staff Training Task Analysis for the Supervisors

BST
1) Reads instructions, data sheet, and manding task analysis.
2) Plays video-modeling tape.
3) Role plays the child in the preference assessment
4) Takes data- circle a + or – for steps A-D.
5) Gives feedback
6) Role-plays the child in a level 1 mand (1,2, 3 and 4 from table 1)
7) Take data- circle a + or -
8) Gives correct feedback to the experimenter
9) Role-plays the child in a level 2 mand (steps 1,2, 5 and 6 from table 1)
10) Take data- circle a + or -
11) Gives correct feedback to the experimenter
12) Role-plays the child in a level 3 mand (steps 1,2, 7 and 8 from table 1)
13) Take data- circle a + or -
14) Gives correct feedback to the experimenter
15) Role-plays the child in a level 4 mand (steps 1,2, 9 and 10 from table 1)
16) Take data-circle a + or -
17) Gives correct feedback to the experimenter
18) Role-plays the child in a level 5 mand (steps 1,2, 11 and 12 from table 1)
19) Take data – circle a + or -
20) Gives correct feedback to the experimenter

The supervisor provided feedback after collecting data on the experimenter's (teacher assistant's) behavior, such as, "good job delivering the target item immediately after a mand" and corrective feedback such as, "you skipped over the level 2 prompt, please include it next time". The experimenter took data on the supervisors responses on a copy of Table 3 as she role played the part of the child.

After the training session the experimenter gave feedback on the supervisor's use of BST. The experimenter told the supervisor the steps that were performed correctly and the steps that were performed incorrectly. Feedback included descriptive praise for performing correct steps from the BST task analysis, described above. The supervisors met criterion when they received 90% across two consecutive training sessions.

Teacher Assistant Training

After the supervisors completed their training the supervisors trained the teacher assistants to implement the preference assessment and manding procedure after the teacher assistants completed baseline. The experimenter first conducted baseline sessions with the teacher assistants, the supervisor then trained the teacher assistants, and finally the experimenter conducted post-training sessions. The experimenter held sessions between 1 and 3 times a week, except during weeks when the school was closed, when teacher assistants, supervisors or children were absent and when the supervisors were training the teacher assistants.

Baseline Instructions. At the start of the teacher assistant training, the experimenter gave the teacher assistants the instructions (Appendix A), the manding task analysis (Table 1), a data sheet (Appendix B), the child's preferred stimuli determined from the experimenter's initial preference assessment, read all tools aloud and asked

them if they had any questions about the procedure. The experimenter answered all questions related to the procedure or materials. The experimenter then brought the child participants to the teacher assistant. The teacher assistant told the experimenter when they were ready for the experimenter to start the timer. The experimenter did not answer any questions asked by the teacher assistant, except questions related to operating the child's preferred stimuli (e.g., lowering the volume on the DVD player) during the 15 minute session. The experimenter said, "I'm sorry, but I can't answer that right now" if teacher assistants asked for feedback during the experiment.

Training. Each teacher assistant training session consisted of instructions, modeling via videotape, practice and feedback by the supervisor. Teacher assistant training sessions were 45 min in length and were held 1-2 times a week until the teacher assistants met criterion (90% correct across two consecutive sessions). During the first BST session the supervisor provided feedback to the teacher assistant on their baseline performance, such as "you did not collect data after each mand; please collect data on every trial." This was not repeated in subsequent sessions.

Instructions. Instructions were the same as those in the baseline instructions condition.

Modeling. The supervisor played a DVD of a model performing the appropriate responses for the teacher assistant. The model displayed all components and prompt levels listed in the manding task analysis (Table 1).

Rehearsal. After modeling, the supervisor role played all task analysis components with the teacher assistant. The supervisor played the part of the child during

the role play and the teacher assistant performed all 4 preference assessment steps and 12 mand-training steps in 5 trials. Rehearsal lasted approximately 10 minutes.

Feedback. The supervisor provided feedback on the teacher assistant's performance. After rehearsal, the supervisor showed the teacher their checklist (Appendix C) showing a plus next to the steps that were performed correctly and a minus next to the steps that were performed incorrectly. Feedback included praise for performing correct steps from the task analysis, such as "You did great providing a prompt when no mand was given after three seconds" and correction statements for steps that were performed incorrectly, such as "the items were spaced too closely together, please leave 1 in. in between the items".

Teacher assistants met criterion to enter post training with the children when they received a score of 90% correct on all the components of the manding task analysis for two consecutive sessions.

Post-Training Sessions. After the teacher assistants meet criterion, they resumed sessions in the same area where instruction baseline sessions were conducted and the experimenter gave the same instructions. Post training sessions were identical to baseline sessions.

Retraining. The experimenters asked supervisor 2 to conduct an additional booster training with Ms. L when she showed decline in responding similar in level to her baseline responding. The retraining consisted of feedback on performance during post training and a 5 trial role play.

Experimental Design

The experimenter used a multiple-baseline-across-subjects design to assess the effects of the supervisor-run BST procedure on the percentage of correct steps performed by the teacher assistants, the number of mand opportunities, and the percentage of child Level 1 through 5 mands.

Generalization Training and Probes

The experimenter assessed generalization in two ways. For the children, the experimenter used two different sets of stimuli during mand training sessions. For example, when "spin" was the mand, the experimenter used a different set of top toys during every third or fourth mand training session to plan and assess generalization across stimuli. The stimuli varied along at least one dimension, e.g., color, shape or size, purpose or a combination of the four. One element of the stimulus always remained constant. For teacher assistants, the experimenter assessed response generalization across children. Experimenters paired teacher assistants with a different child approximately every third or fourth session. The manding task analysis was scored during these sessions. Probe sessions were identical to baseline and post-treatment sessions, except for the child or the stimuli. The experimenter conducted probe sessions during baseline instructions and post training phases. Teacher assistants did not receive feedback during generalization probe sessions, but they received instructions and had a chance to ask questions before starting.

Data Collection

Supervisor Training. Experimenters required supervisors to collect data during the mand training role play with the experimenter and during their one manding session

with the generalization child using the data sheet in Appendix B. To calculate percentage of Level 1 mands from Appendix B during both sessions, Level 1 mands were divided by the total number of mand opportunities and then multiplied by 100. The experimenter took data on the supervisor's responses during these two sessions. For the preference assessment, the experimenter recorded a plus or a minus for each component on the mand training task analysis for each trial. The experimenter then divided the number correct by the total number and multiplied by 100. The experimenters calculated data the same way for each mand opportunity. During BST, the experimenter collected data on the number of components the supervisors completed correctly from the 20-step staff training task analysis with pen by putting a plus or a minus next to each step on the BST task analysis (Table 3). The supervisors had to complete all parts of each task analysis step correctly to receive a plus for the step. For example, if the supervisor provided the correct prompt but gave the child the item for 3 minutes, then the experimenter would score that step as incorrect. The experimenter calculated percentage correct by dividing the number of correctly completed components by the total number of components. Supervisors also collected data during the role play on the experimenter's (child's) responses using the data sheet, Appendix B. On Appendix B, supervisors listed the experimenter's (child's) mand, and marked the box that corresponded to Table 1 (Level 1-5).

Teacher Assistant Training. During the sessions when the supervisors trained the teacher assistants, supervisors took data on the teacher assistant's role-play responses using the checklist, Appendix C. To calculate percentage of correct responses the experimenter divided the number of correctly completed components by the total number of components.

Baseline and Post Training. Teacher assistants collected data during the baseline instruction and post training sessions on the data sheets provided to them, Appendix B, in the same manner as the supervisors who used Appendix B. The experimenter recorded the number of correct task analysis steps performed by the teacher assistants and the prompt level that results in a mand for an item by the children after each session by scoring the recorded DVD's. The experimenter also recorded the number of mands and mand opportunities and recorded the number of Level 1, 2, 3, 4 and 5 mands. The experimenter calculated the number unprompted mands (Level 1) by dividing the number of Level 1 mands by all mands at other prompt levels. Level 2 through 5 mands were calculated in the same manner.

Generalization Sessions. During generalization across materials sessions experimenters recorded data on the child's number and level of mands with the novel toys and on the teachers assistants' percentage of correct teaching responses from the mand task analysis. During the generalization across child participants sessions experimenters collected data on the teacher assistants' percentage of correct teaching responses from the mand task analysis and on the percentage and level of the novel childrens' mands.

Inter-observer Agreement and Experimental Integrity

The experimenter and two graduate students recorded data from the videotapes for purposes of inter-observer agreement (IOA). The graduate students did not receive feedback on data collection. To prevent observer drift, a 5 to 10 min practice session was conducted before each IOA collection session which experimenters terminated when the they were in 100% agreement with the graduate student. Experimenters calculated IOA for the prompt level at which a mand occurred and correct and incorrect steps from the

task analysis. Experimenters calculated IOA by dividing the total number of agreements by the total number of agreements plus disagreements and multiplying this value by 100%. The independent observers scored the entire 15 min videotaped session after the experimenter scored the tape.

Experimenters collected IOA for between 25% and 30% of the baseline and post-training sessions. IOA for Ms. J was 90% (range, 80% to 100%) for task analysis steps. For Ms. L, IOA was 85% (range, 80% to 90%) for task analysis steps. IOA for Ms. D, was 89% (range, 78% to 100%) for task analysis steps. IOA for the prompt level at which the mands occurred for Jack and Don was 92% (range, 83% to 100%). IOA for Ginny and Tony's mands was 86% (range, 81% to 91%). IOA for Lucy and Jess was 95% (range, 80% to 100%).

Social Validity

Teacher assistants and supervisors involved in the study filled out a questionnaire once during the study (see Appendix D). The questionnaire contained statements related to the importance and generality of the study. Experimenters provided a Likert scale with a range from 1 (strongly agree) to 5 (strongly disagree) for each question and a comments section at the bottom of the questionnaire.

Results

Experimenters present the staff members data followed by the children's data. Staff data are represented by closed data points and child data are represented by open data points.

Staff Data

Baseline and Post Training Teaching Sessions

Figure 1 depicts the percentage of correct teacher assistants' mand teaching responses. In Dyad 1, Ms. J demonstrated between 0% and 50% correct mand teaching responses, represented by closed circles, during baseline compared to 95% and 100% in post training. In Dyad 2, Ms. L demonstrated between 0% and 32% correct mand teaching responses during baseline that increased to between 40% and 81% during post training. Her lowest percentage of correct responses in post training was 40% during session 18. Responses increased to 85% after retraining. In Dyad 3, Ms. D demonstrated between 12% and 30% correct mand teaching responses during baseline which increased to 100% during post training.

Staff Generalization Across Materials

In Dyad 1, Ms. J demonstrated between 2% and 17% correct responses, represented by closed triangles, during the generalization across materials probes in baseline compared to 94% and 100% in post training. Ms. L demonstrated between 1% and 14% correct during the generalization across materials probes compared to 81% and 68% during post training and 81% after retraining. Ms. D demonstrated between 25% and 36% correct during which increased to between 84% and 88% during post training.

Staff Generalization Across Children

In Dyad 1, Ms. J demonstrated 32% correct responses, represented by closed squares, during the generalization across child participant probe in baseline compared to between 47% and 88% in post training. Ms. L demonstrated between 29% and 40% correct compared to 33% and 100% during post training. Her lowest percentage of

correct mand teaching responses during post training was 33% in session 19. Responses increased to 89% after retraining. Ms. D demonstrated between 17% and 48% correct compared to between 66% and 100% during post training.

Child Data

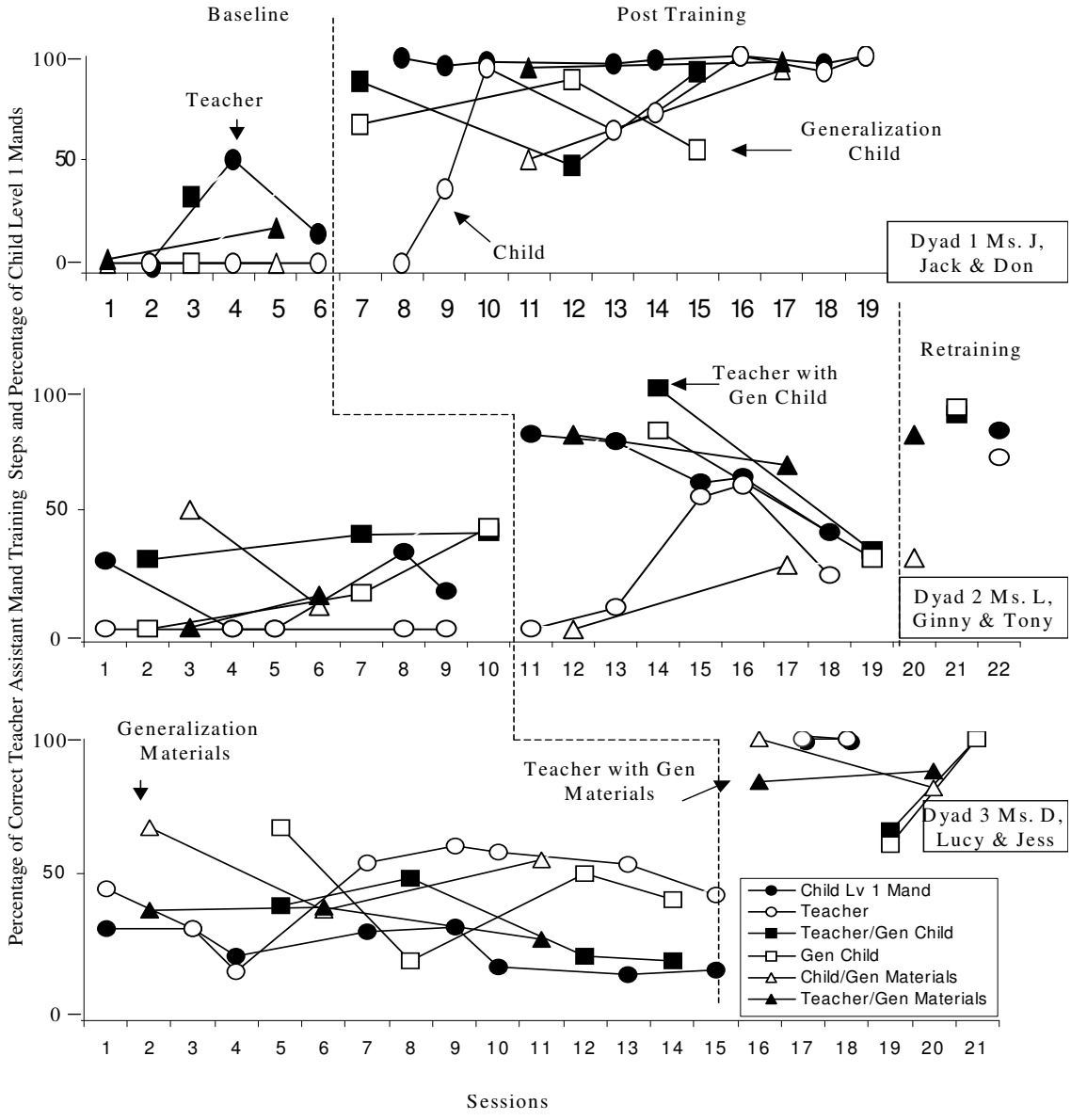
Baseline and Post Training Teaching Sessions

As seen in Figure 1, Jack in Dyad 1 emitted 0% Level 1 mands, represented by open circles, during baseline. During post training, Jack demonstrated an increase to between 0% and 100% Level 1 mands. In Dyad 2 Ginny emitted 0% Level 1 mands during baseline compared with 0% and 60% during post training and 71% after retraining. Lucy in Dyad 3 emitted between 13% and 60% Level 1 mands during baseline that increased to 100% for both sessions during post training.

Child Generalization Across Materials

In Dyad 1, Jack emitted 0% Level 1 mands, represented by open triangles, during the generalization across materials probe that increased to between 50% and 93%. In Dyad 2, Ginny emitted between 10% and 50% Level 1 mands compared with 0% and 27% during post training and 30% after retraining. During baseline, Lucy demonstrated between 36% and 67% Level 1 mands which increased to between 88% and 100% during post training.

Figure 1. Percent of responding during baseline and post-training and retraining. Data are plotted as the percentage of child Level 1 mands and the percentage of the teacher assistants correct task analysis steps. Open data points represent child data and closed data points represent teacher data. Squares represent generalization across child probes and triangles represent generalization across materials probes.



Generalization Child Participants

The generalization child participant in Dyad 1, Don, emitted 0% Level 1 mands, represented by open squares, which increased to between 55% and 89% during post training. In Dyad 2, Tony emitted between 0% and 42% Level 1 mands compared with 30% and 82% during post training and 92% after retraining. In Dyad 3, Jess emitted between 17% and 67% Level 1 mands compared to 60% and 100% during post training.

Summary of Teacher Assistant and Child Data in Figure 1

Experimenters observed low percentages of correct mand teaching responses and Level 1 mands for all teacher assistant and child participants during baseline. These responses increased initially during post training for all three teacher assistants. Experimenters also observed a corresponding increase for the children paired with the teacher assistants. This increase was slightly delayed for Jack and Ginny, observing an initial increase in session 7 and 11 in Figure 1 respectively. Ginny did not show evidence of generalization across materials, demonstrated by a low level of open triangles in the middle panel of Figure 1. Ms. L showed a decrease of correct mand teaching responses in sessions 18 and 19 (closed circles, second dyad, middle panel). Ginny and Tony showed corresponding decreases in percentage of Level 1 mands (open circle and square, second dyad, middle panel). Responses increased to levels similar to initial post-training responses after retraining sessions for Ms L, Ginny and Tony.

Prompt Levels 2 through 5, Teaching and Generalization across Materials Sessions

Figure 2 displays the percentage of mands at prompt levels 1 through 5 including generalization across materials sessions for Jack, Ginny and Lucy. Experimenters

discussed mands emitted with a Level 1 prompt in Figure 1 and will omit them here. The sum of measures across prompt levels equals 100%.

As seen in the top panel, Jack's percentage of Level 2 mands, represented by open squares, was between 0% and 50% during baseline. During post training sessions his percentage of Level 2 mands decreased to between 0 and 18%. For Dyad 2, Ginny emitted between 0% and 50% Level 2 mands during baseline compared to between 11% and 64% during post training. After retraining, Ginny emitted between 0% and 20% of her mands with a Level 2 prompt. In Dyad 3, Lucy showed similar responding to Jack, between 0% and 57% of her mands were emitted with a Level 2 prompt during baseline. This number decreased to 0% during post training. Therefore, after post training Jack and Lucy demonstrated decreases in Level 2 mands. Ginny demonstrated a decrease after retraining.

As seen in the top panel, represented by open triangles, Jack's percentage of Level 3 mands was between 0% and 25% during baseline. During post training sessions his percentage of Level 3 mands increased to between 85% and then was between 0% and 30% for the remainder of the sessions. For Dyad 2, Ginny emitted between 0% and 36% Level 3 mands during baseline compared to between 0% and 22% during post training. After retraining, Ginny emitted between 22% and 29% of her mands with a Level 3 prompt. In Dyad 3, Lucy emitted between 0% and 33% of her mands with a Level 3 prompt during baseline and this number decreased to 0% during post training. In sum, all three children emitted Level 3 mands at different percentages during post training. While Jack and Lucy showed a decrease by the end of the study, Ginny continued to emit mands with a Level 3 prompt even after retraining.

As seen in the top panel, Jack's percentage of Level 4 mands, represented by closed squares, was between 0% and 89% during baseline. During post training sessions his percentage of Level 4 mands decreased to between 0% and 21%. For Dyad 2, Ginny emitted between 0% and 29% Level 4 mands during baseline compared to between 0% and 69% during post training. After retraining, Ginny emitted between 0% and 20% of her mands with a Level 4 prompt. In Dyad 3, Lucy emitted between 0% and 56% of her mands with a Level 4 prompt during baseline and this number decreased to 0% during post training. Therefore Jack and Lucy showed similar responding, while Ginny showed an increase in post training, then decrease in retraining to near baseline levels.

As seen in the top panel, Jack's percentage of Level 5 mands, represented by closed circles, was between 0% and 100% during baseline. During post training sessions his percentage of Level 5 mands decreased to between 0% and 29%. In Dyad 2, Ginny emitted between 34% and 100% Level 5 mands during baseline, which decreased to a range of 8% to 23% during post training. After retraining, Ginny emitted between 0% and 10% of her mands with a Level 5 prompt. In Dyad 3, Lucy emitted between 0% and 47% of her mands with a Level 5 prompt during baseline and this number decreased to between 0% and 13% during post training. All of the children's Level 5 mands decreased in post training compared to their baseline sessions.

Summary of Data in Figure 2

In general, Jack and Lucy showed similar patterns of responding in baseline, i.e., higher percentages of mands at prompt Levels 2-5. Although Lucy showed an immediate increase in Level 1 mands after post training and Jack showed an increase shortly after

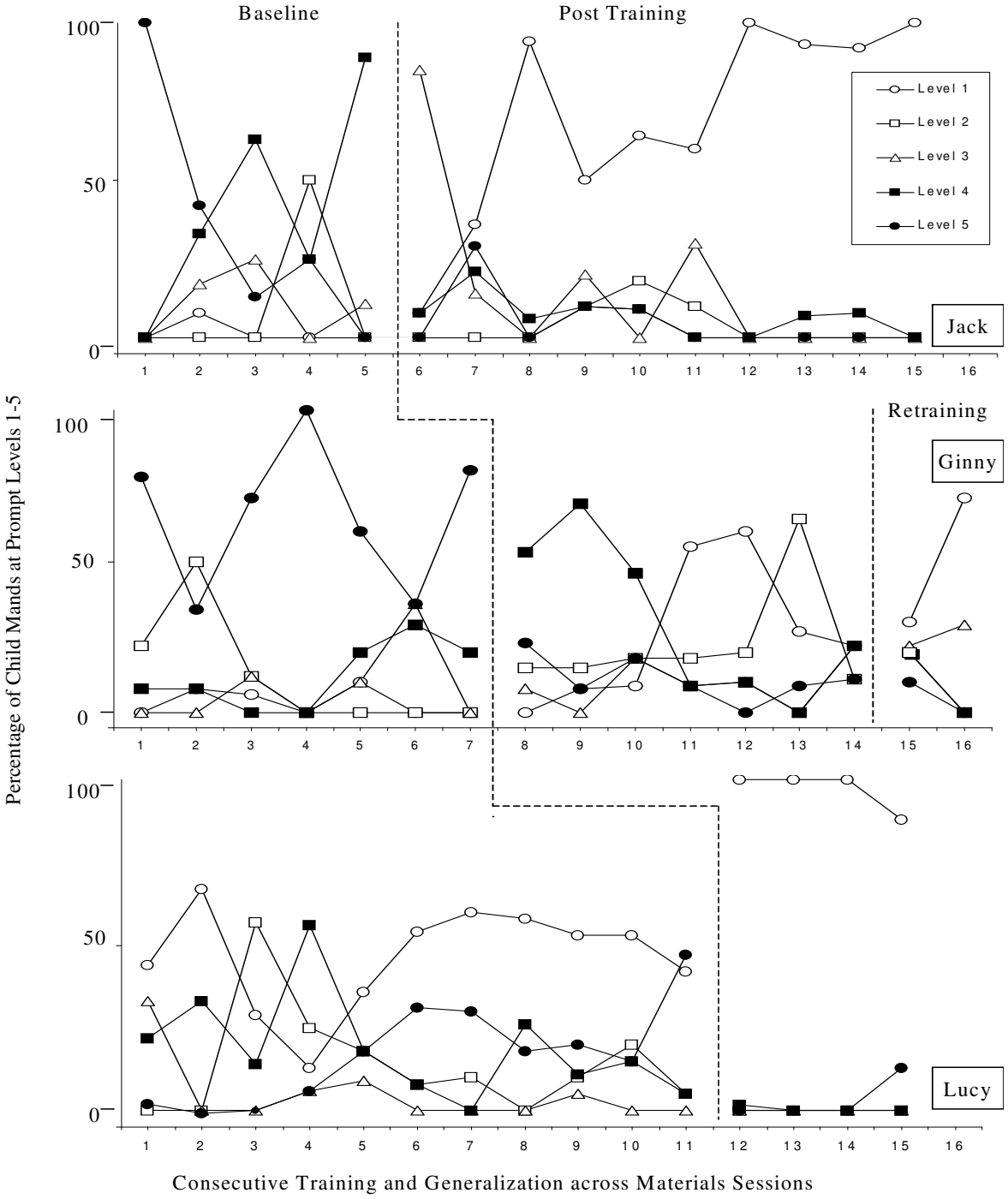
post training, both showed decreases in mands at all other prompt levels. Ginny showed a different pattern of responding.

Prompt Levels 2 through 5, Generalization Child Data

As seen in Figure 3, represented by open squares, the generalization participant in Dyad 1, Don showed an increase in Level 2 mands from 0% in baseline to between 7% and 20% during post training. In Dyad 2, Tony emitted between 0% and 8% of his mands with a Level 2 prompt during baseline. During post training the percentage of mands emitted with a Level 2 prompt increased to between 0% and 40% and decreased to 0% after retraining. In Dyad 3, Jess, showed a decrease in Level 2 mands from between 17% and 67% in baseline to 0% during post training.

For mands with a Level 3 prompt, represented by open triangles, Don showed an increase in mands from 0% in baseline to between 0% and 18% during post training. Tony in Dyad 2 emitted between 0% and 25% of his mands with a Level 3 prompt during baseline. During post training the percentage of mands emitted with a Level 3 prompt decreased to between 0% and was 8% after teacher-assistant retraining. The generalization participant in Dyad 3, Jess, emitted 0% of his mands at Level 3 during baseline and post training.

Figure 2. Percentage of mands at prompt levels 1 through 5 for Jack, Ginny and Lucy in baseline and post training. Open circles represent Level 1, open squares represent Level 2, open triangles represent Level 3, closed squares represent Level 4 and closed circles represent Level 5 mands.



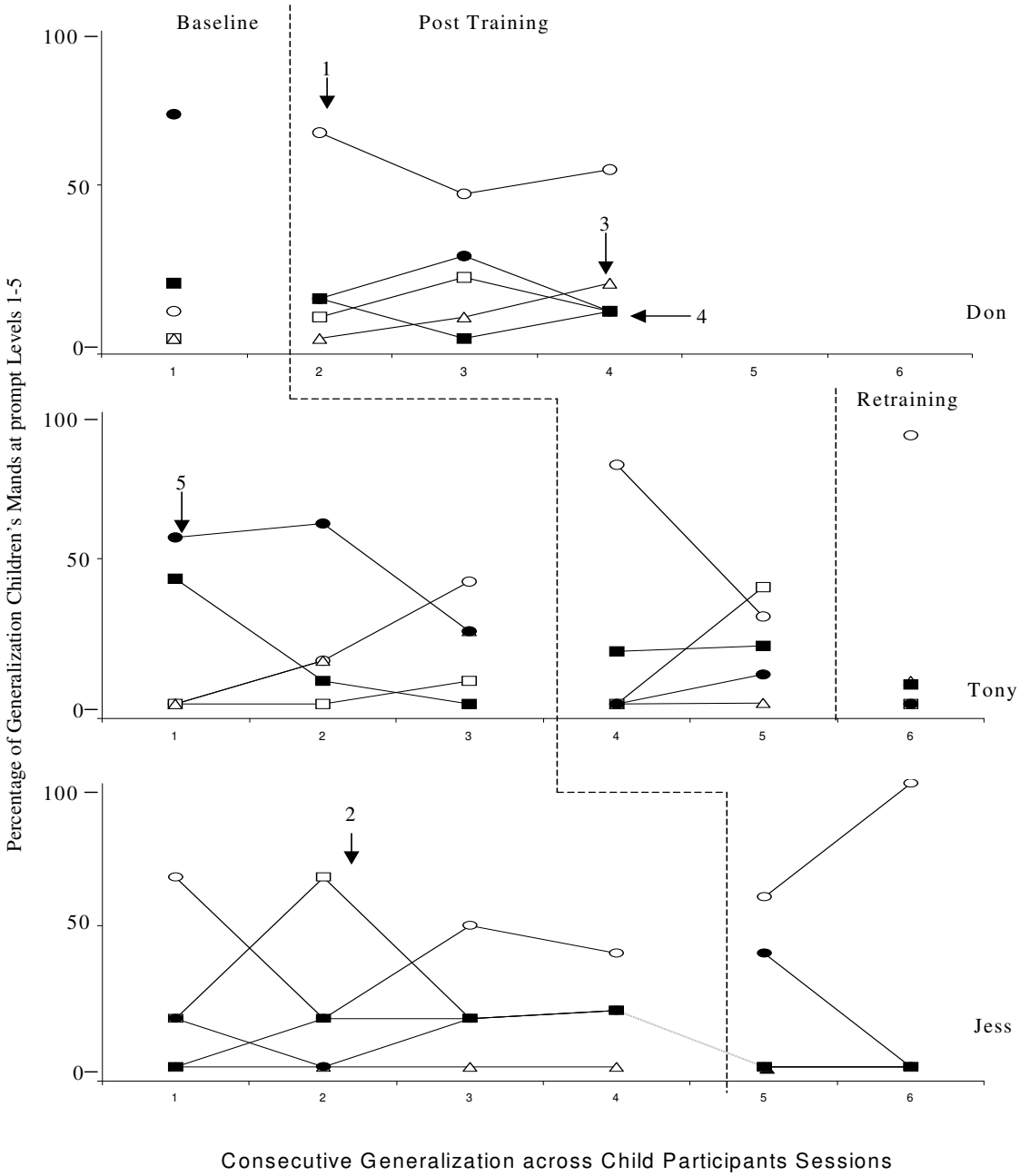
For mands with a Level 4 prompt, represented by closed squares, in Dyad 1, Don showed a decrease in Level 4 mands from 18% in baseline to between 0% and 13% during post training. Tony in Dyad 2 emitted between 0% and 43% of his mands with a Level 4 prompt during baseline. During post training his percentage of mands emitted with a Level 4 prompt increased to between 18% and 20% and was 8% after teacher-assistant retraining. In Dyad 3, Jess, emitted between 0% and 20% of his mands at Level 4 during baseline and they decreased to 0% during post training.

In Dyad 1, Don showed a decrease in Level 5 mands (closed circles) from 73% in baseline to between 9% and 27% during post training. Tony in Dyad 2 emitted between 25% and 57% of his mands with a Level 5 prompt during baseline. During post training the percentage of mands emitted with a Level 5 prompt decreased to between 0% and 10% and to 0% after teacher-assistant retraining. The generalization participant in Dyad 3, Jess, emitted between 0% and 20% of his mands at Level 5 during baseline compared to between 0% and 40% during post training.

Conclusion

In general Don and Tony demonstrated similar responses to prompt Levels 2-5, i.e., decreases for Levels 4 and 5 and increases in Level 2 mands. Don demonstrated a slight increase and Tony demonstrated a slight increase in Level 3 mands. Jess' pattern of responding was different than Don and Tony. Jess showed an increase in Level 2 mands, consistent Level 3 in baseline and post training, a decrease in Level 4 and an increase in Level 5 mands.

Figure 3. Percentage of mands at prompt levels 1 through 5 for generalization participants, Don, Tony and Jess in baseline and post training. Open circles represent Level 1, open squares represent Level 2, open triangles represent Level 3, closed squares represent Level 4 and closed circles represent Level 5 mands.



Summary of Figures 2 and 3 for all Child Participants

Experimenters observed that as Level 1 (unprompted) mands increased, mands at all other prompt levels decreased. As seen in Figure 2, during baseline, Jack emitted a majority of mands with a Level 4 and 5 prompt. During post training, experimenters observed a sequential effect where he initially emitted more mands with prompt Level 3 (session 6) and then emitted mands at Level 1at a higher proportion than other mand levels during the remainder of the sessions. Experimenters observed a similar pattern initially for Ginny as she emitted a majority of her mands during baseline after a Level 5 prompt (Figure 2). Initially following training she emitted most mands following a Level 4 prompt. Experimenters observed a shift in this pattern of responding toward Level 1 and 2 during sessions 11 to 12 and an increase in Level 2 mands when her correct responding started to decrease (session 13). Her responding was distributed more equally across all prompt levels during session 19. After teacher-assistant retraining, Ginny emitted a majority of her mands with a Level 1 prompt. In Dyad 3, during baseline Lucy emitted a majority of mands after a Level 1 prompt, however, the percentage of Level 1 mands averaged around 50% and never exceeded 67% during baseline because mands were frequently made at prompt Levels 2, 4 and 5 (Figure 2).

Number of Opportunities

The average number of mand opportunities per session, initiated by both teacher assistants and children ranged between 7 and 13 for all sessions for all participants. During baseline, Jack and Don emitted an average of 10 mand opportunities compared to 13 during post training. Ginny and Tony emitted an average 12 mand opportunities during baseline compared to 11 in post training. After retraining Ginny emitted an

average of 7 and Tony emitted 13 mands. Lucy and Jess emitted an average of 10 mand opportunities compared to 11 in post training. Therefore the number of mand opportunities was similar before and after training for all child participants.

Supervisor Training

All three supervisors completed the review BST session within 30 min. During the five-trial role play with the experimenter, supervisor 1 scored 100%, Supervisor 2 scored 95% and supervisor 3 scored 95% correct out of a possible 100% on the steps from Table 1 for five mand trials. During the 15 min mand training session where the supervisors conducted mand training with the children, supervisor 1 scored 100%; supervisor 2 scored 100% and supervisor 3 scored 93% out of a possible 100% on the steps from table 1. Therefore, all three supervisors met criterion to begin the two session BST teacher assistant training within two sessions. During sessions 1 and 2, supervisor 1 scored 95% and 100% respectively. Supervisor 2 scored 100% during both trainings. Supervisor 3 scored 95% during both trainings. In sum, supervisors met criterion to train staff within approximately 2.5 hours distributed across four sessions.

Teacher Assistant Training

All teacher assistants completed the supervisor run BST procedure in two 45 min sessions. Ms. J scored 90% correct on the TA steps during the first training and 100% correct during the second training. Ms. L scored 97% correct on the TA steps during the first training and 100% correct during the second. Ms. D scored 100% correct on the TA steps during both sessions. Ms. L's retraining was conducted in approximately 15 min

Social Validity

As seen in Table 4, all teacher assistants circled a 1 for the first question indicating that they strongly agreed that requesting was an important skill for children with autism to learn. All teacher assistants circled a 1 or a 2 for the second question which indicated that they agreed or strongly agreed that the child they were working with was learning to request. All teacher assistants circled a 1 or a 2 for the third question which indicated that they agreed or strongly agreed that the procedure was effective and efficient. All teacher assistants circled a 1 on the fourth question which indicated that they strongly agreed that they would recommend the procedure for a child who does not request. Ms. J, Ms. L and Ms. D again completed the questionnaire after BST training and circled a 1 for the fifth question which indicated that they strongly agreed that the training portion was informative and that they changed their behavior based upon feedback. They also circled a 1 or 2 on the last question which indicated that they agreed or strongly agreed that the training was effective and efficient. All supervisors circled a 1 for all questions indicating that they strongly agreed with all statements.

Table 4.

Staff Ratings on the 5 Point Likert Scale from the Social Validity Questionnaires

	Staff Members					
Question	1	2	3	4	5	6
1	1	1	1	1	1	1
2	1	1	2	1	1	1
3	1	1	2	1	1	1
4	1	1	1	1	1	1
5	1	1	1	1	1	1
6	1	2	1	1	1	1

Note. 1=strongly agree and 2=agree

Discussion

Contributions

The present study was successful in providing a mand-training task analysis that displays an effective least to most mand training procedure. When this mand training procedure was implemented correctly, experimenters observed increases in children's percentage of unprompted mands. Second, this study was the first to have combined BST and pyramidal training with mand training and observed an increase in children's unprompted mands. Third, this study was the first to obtain generalization of child mands across 2 of the 3 child participant's items and generalization of teacher-assistant teaching responses across children. Fourth, the current provided a protocol for an efficient staff training procedure, consisting of less than 2.5 hours, which was effective in training a paraprofessionals, which could be used in schools or homes for children with autism spectrum disorders.

Staff Effects

Pyramidal training was highly efficient and effective in training 3 supervisors to conduct staff training using the BST model. Subsequently, BST was also highly effective and efficient in training 3 teacher assistants to conduct mand training accurately. All teacher assistants generalized staff teaching skills across children. Staff members supported the external validity of the study by providing high ratings on the social validity questionnaire. The combined use of pyramidal training and BST in classrooms targeting expressive language, specifically manding with children with an autism spectrum disorder.

Results are consistent with the literature on pyramidal training which demonstrates that supervisors can teach staff to train other staff members (Kuhn, et al., 2003; Shore, et al., 1995; Neef, 1995; Page, et al. 1982, Schlosser, et al., 2006). The present study extended the literature on pyramidal training by demonstrating that supervisors can be taught to become effective staff trainers in only 2.5 hours compared to the 3-hour workshop, plus modified BST and consultation sessions used in the Schlosser et al. (2006) study. The training used in the present study can be implemented in home and school settings, and without consultation sessions.

The present study is also consistent with the literature on BST on which demonstrates that instructions, modeling, practice and feedback are effective components in teaching staff new skills (Dib & Sturmey, 2007; Johnson, et al., 2005; Lavie & Sturmey, 2002; Lerman, et al., 2004; Sarokoff & Sturmey, 2004). Related to BST, the present study demonstrates that supervisors can train teacher assistants to implement mand training in two 45 min sessions using a video-modeling component. This is an decrease in training time from Lavie and Sturmey (2002) who implemented effective staff training in two 80 min sessions and Lerman et al. (2004) training, which used a 17.5 hour workshop and hands-on training to teach ABA techniques. As in Nigro-Bruzzi and Sturmey (in press), the present study confirms that staff members can be quickly taught to teach children with developmental disabilities to mand.

The present study demonstrates that some staff may need additional feedback after initial training is completed. Even though all staff received the same training, individual differences in staff member performance were unpredictable. Further, initial changes in behavior do not ensure maintenance of the behavior change. Suggesting that

periodic supervision, data collection on specific staff behaviors and feedback, possibly with a role play component is necessary for supervisors to maintain staff program implementation at an effective level for all staff members. Before retraining, Ms. L typically scored higher on the task analysis when the child initiated a mand because she removed the item from the child's hand and follow the prompt sequence. She scored lower when the child did not initiate a mand because she often omitted step 2 on the TA, "find/show me the one you want" and would use one of the prompt levels, often out of sequence, to evoke a mand. These errors were decreased after supervisor 2 provided additional feedback during retraining.

Child Effects

In baseline, many mand opportunities did not result in child Level 1 mands. After training the majority of mand opportunities resulted in Level 1 mands for all children. The validity of this intervention to change expressive language was supported by systematic increases in child Level 1 mands and the children's generalization of mands across materials.

Nigro-Bruzzi and Sturmey (in press) observed that an increase in the number of mand opportunities did not result in an increase in the number of unprompted mands, demonstrated by the large number of prompted mands during baseline. The same was true with the present study, as number of mand opportunities was similar before and after training. This confirms that the teaching procedures and not an increase in the number of mand opportunities were responsible for the increase in Level 1 mands.

The present study extended the literature related to programming for generalization across children and materials because it is the first study that examined

generalization across two domains while assessing manding. It is essential for clinicians to plan and assess generalization during mand training when teaching new mands to children with an autism spectrum disorder. Further, classroom teacher-assistants are paired with unfamiliar children frequently and must learn to identify the relevant variables and discriminative stimuli needed for mand training, regardless of student individual differences. It is important to note that Ginny did not show evidence of generalization across materials which may have increased her dependence on prompt Levels 2-5 during sessions 9, 13 and 16 in Figure 2. Her teacher-assistant, Ms. L, showed decreases in responding on the manding TA which, in turn, decreased Ginny's percentage of Level 1 mands and increased mands at Levels 2-5. In this experiment teacher assistant behavior clearly affected child behavior.

Jack and Ginny responded to different prompt levels over the course of the study in a progressive manner, i.e., initially more mands emitted at Level 5, then at Level 4, then at Level 3, etc. This may have been because the experimenters designed the prompts to be provided in a least to most restrictive order and less restrictive prompts were used more frequently by the teacher assistants as the items acquired stimulus control over the children's mands. Lucy did not demonstrate this pattern of responding. The experimenters observed that Ms. D often provided the most intrusive prompt before less restrictive prompts, similar to errorless teaching (Terrace, 1963), but Ms. D did not fade her prompts which may have resulted in Lucy's mands stabilizing around 60% during baseline (Figure 1). It is also possible that Lucy may have already acquired an unprompted manding repertoire prior to the study, but it was not evident because Ms. D often used an imitative prompt (Level 4) before a time delay (Level 1). After Ms. D

learned to use least to most restrictive prompting by implementing the task analysis correctly, Lucy's correct Level mands increased to between 80% and 100%.

Clinical Applications and Recommendations

The 3 supervisors in the present study were all licensed NYS teachers with Master's degrees in psychology or education. Teacher assistant 1, Ms. J, was also a licensed NYS teacher. All of these staff members learned the procedures quickly and performed at levels above criterion without further intervention. Teacher assistants 2 and 3 were certified NYS teacher assistants, or paraprofessionals. Although Teacher assistant 2 showed a decrease in performance, there was not strong enough evidence to conclude that licensed teachers are more effective at teaching manding compared to paraprofessionals, after effective and applied behavior analytic based training procedures are implemented. Therefore, the experimenters suggest that certified teacher assistants might serve as effective behavior change agents, after data-based effective training and ongoing supervision by a behavior analyst, extensively trained ABA certified teacher or psychologist.

Note that the staff members in the present study often made consistent errors that should be addressed during BST. Ms. J, Ms. L and Ms. D frequently used a Level 2 through 5 prompt without a Level 1, or time delay prompt initially. Training teacher assistants to refrain from using more intrusive prompts when a time delay is sufficient may decrease prompt dependency demonstrated by many children with developmental delays. In addition, all three teacher assistants used a non-specific verbal prompt (Level 2) when the task analysis specified the use of an instruction, i.e., find the one you want, show me the one you want, etc. (step 2, Table 1). Training teacher assistants to

discriminate their use of prompts will help eliminate these errors. Further, teacher assistants frequently repeated S^Ds instead of physically prompting the child or using a stimulus response to evoke a response. Reducing or eliminating this behavior will help teacher assistants obtain stimulus control of child responses. It is recommended that these prerequisite responses are included in the training protocol. A final suggestion is that teacher assistants receive training on establishing operations. Hartman and Klatt (2005) found that establishing operations and/or levels of preference affected acquisition of mands for two children with autism. The authors suggested that clinicians should deprive children of specific highly preferred stimuli for 23 hours before conducting mand training.

Limitations and Suggestions for Future Research

This study has six limitations. First, the experimenter maintained control of access to preferred items, identified through preference assessments. Experimenters ensured that at least 24 hours of stimulus deprivation occurred before each session because the experimenter removed the items from the child's environment; however, application of mand training in routine service settings may not be able to achieve this level of deprivation for some items, such as food and drinks, or other items that are freely available in the home or classroom. Training parents and staff to effectively manipulate establishing operations by limiting access to items, even for a few hours at a time, may be beneficial when implementing these procedures in clinical settings. Second, experimenters maintained a 1:1 staffing ratio during mand training. In routine service settings mand training may take place in groups of children or with family members with multiple simultaneous demands, such as a parent shopping with two children. Future

research in mand training should begin to develop procedures that are readily usable in many different service contexts. A third limitation is that this study only taught 1 to 2 word vocal mands. Although Jess often added the carrier phrase, or frame, "I want" before the target mand, this was not required for reinforcement. Future research should evaluate the effectiveness these procedures to teach non-vocal mand and more complex vocal mands, such as mands for actions and with carrier phrases and adjectives preceding the target mand. A fourth limitation was the decrease in correct implementation of teaching procedures by Ms. L. Although a brief retraining procedure was effective in increasing her teaching responses and increasing child Level 1 mands, periodic supervision and feedback should be programmed into clinical settings to maintain behavior change and prevent retraining. Fifth, although supervisors collected data on the BST sessions with the teacher assistants, the experimenter was not present to assess the procedural integrity of the supervisor-conducted teacher assistant trainings in an attempt to replicate a typical training session. Future studies should consider using videotape or audiotape that can be operated by the supervisors to ensure that supervisors conduct all components of BST accurately. Sixth, this study did not address the behavior analytic concepts underlying the components of behavioral skills training. Although Miltenberger (2001, p. 216) states that role play, modeling and instructions my serve as antecedents, rehearsal of the target behavior may serve as the behavior to be modified, and feedback may serve as a consequence in a three-term contingency, research has not yet identified the functions of BST components.

Conclusions

Pyramidal training using BST procedures was effective in training 3 supervisors to become effective staff trainers and allowed them to implement BST targeting mand training with three teacher assistants, who effectively taught 6 children to mand without prompting. The teacher assistants generalized their teaching responses across children and child participants generalized novel mands across materials. A larger number of neither mand opportunities nor a longer instructional session was necessary to facilitate the increase in expressive language. This staff training, combined with the addition of periodic feedback and mand teaching procedure was highly recommended for clinical applications.

Appendix A

Instructions for the first and subsequent sessions for the Teacher Assistants during baseline and post training.

Instructions for the 1st session:

A mand is a request made by one person and heard by another. A mand may be verbal, pictorial or gestural.

Today we will try to teach the child you will be paired with to mand.

We will do this in four steps:

1. Conducting a *preference assessment* to determine what toys the child likes. Then we will conduct mand training.

2. During mand training you will try to teach the child to request.

3. After the child selects a toy you will remove the toy from the child's hand. You will hold the toy two feet away from the child's face giving the child a chance to verbally request. If the child does not request, you will follow the steps on the Task Analysis.

4. To take data, write the name of the item on a data sheet and the prompt used.

-In a little while, you will have the chance to try to have the child request items from you. You will have 15 minutes to teach requesting. I will not answer any questions during those 15 minutes. Feedback on your teaching today will not be provided. During those 15 minutes, please try to stay in the area provided with the student. You will be given several of the child's favorite toys. I will let you know when the time is up.

-We will now discuss steps that are part of mand training. These are the steps I will be measuring when you are working with the student. Please look at Table 1.

(TIME TO DISCUSS Table 1)

Do you have any (further) questions?

-We will now discuss data collection. Please look at the attached data sheet.

(Time to discuss data sheet)

Baseline will begin.

2. Instructions for all following sessions:

Today we will again try to teach the child you will be paired with to mand.

The session will last for 15 minutes. I will tell you when time is up.

Please look over the required steps and attached data sheet (Table 1). Let me know if you have any questions.

Appendix B

The data sheet used by the Supervisors and Teacher Assistants to collect data on mands.

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3																																
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2																																
1																																
Mands																																

Appendix C

Checklist used by the supervisors to record data on teacher assistant behavior during behavioral skills training.

Preference Assessment:

Did teacher assistant?

List items	put items in array	say Find the..	Take item away	start again

Trial 1, Level 1:
Did Teacher assistant....

☐ 1. Put items out in array
☐ 2. Told you "find/get show the one you want"
☐ 3. Immediately remove the item from your hands, held it approximately 2 feet in front of your face and waited 3 seconds for the mand. Also, gave access to the toy for 1 minute if the you manded.
☐ 4. Took correct Data

Trial 2, Level 5:

☐ 1. Put items out in array
☐ 2. Said "find/get show the one you want"
☐ 3. Immediately remove the item from the your hands, held it approximately 2 feet in front of your face and waited 3 seconds for the mand.
☐ 4. Said "what do you want"
☐ 5. Gave Verbal P, eg. m for music.
☐ 6. Gave whole word up to 3 times
☐ 7. put item back in array
☐ 8. took data

Trial 3, Level 4:

☐ 1. Put items out in array
☐ 2. Said "find/get show the one you want"
☐ 3. Immediately remove the item from your hands, held it approximately 2 feet in front of your face and waited 3 seconds for the mand.
☐ 4. Said "what do you want"

5. Gave Verbal P, e.g. m for music.
☐ 6. Gave whole word up to 3 times and delivered item when you manded.
☐ 7. Took correct data.

Trial 4, Level 2:
☐ 1. Put items out in array
☐ 2. Said "find/get show the one you want"
☐ 3. Immediately remove the item from your hands, held it approximately 2 feet in front of your face and waited 3 seconds for the mand.
☐ 4. Said "what do you want" and gave item up to 1 minute.
☐ 5. Took data

Trial 5, Level 3:
☐ 1. Put items out in array
☐ 2. Say "find/get show the one you want"
☐ 3. Immediately remove the item from the your hands, held it approximately 2 feet in front of your face and waited 3 seconds for the mand.
☐ 4. Said "what do you want"
☐ 5. Gave Verbal P, eg. m for music and Gave you item when manded.
☐ 6. Took correct data.

Appendix D

Social validity questionnaire distributed to the Teacher Assistants.

Name_____

Child's name_____

Date_____

BASELINE INSTRUCTIONS POST-TRAINING

Social Validity Questionnaire

Please circle a number between 1 and 5.

1= strongly agree, 2=agree, 3=neutral, 4=disagree, 5=strongly disagree.

1) Requesting is an important skill for children with autism to learn. 1 2 3 4 5

2) The child I am working with is learning to request. 1 2 3 4 5

3) The procedure is effective and efficient. 1 2 3 4 5

4) I would recommend this procedure for a child who does not request. 1 2 3 4 5

Only complete 5 and 6 after training:

5) The training portion of the study was informative and I changed my behavior based upon feedback. 1 2 3 4 5

6) The training was efficient and effective. 1 2 3 4 5

COMMENTS:

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