

## Generalized Negatively Reinforced Manding in Children with Autism

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Individuals with developmental disabilities are often unable to influence their social environment in traditional ways (i.e., vocal language) and frequently exhibit challenging behaviors (e.g., aggression and self-injury) because such behaviors were previously reinforced under similar conditions. While the area of positive reinforcement manding has been well-documented and empirically validated, there is less research in the area of negatively reinforced manding—particularly in the area of negatively reinforced manding of nonpreferred items. Using a multiple baseline design across participants, this study sought to teach three children with autism to replace their challenging behaviors with more socially appropriate ways to request the removal of nonpreferred items. Results showed that all participants were able to learn the negatively reinforced mand response and these mand responses were generalized to other untrained items. In addition to extending the research in the area, the study empirically defined a procedure for teaching negatively reinforced manding of nonpreferred items. Moreover, teaching the mand response resulted in quality of life improvements for all participants and their families.

*Key words:* manding, negative reinforcement, functional communication training, autism.

Individuals with developmental disabilities are often unable to influence their social environment in traditional ways (i.e., vocal language) and frequently exhibit challenging behaviors (e.g., aggression and self-injury) because such behaviors were previously reinforced under similar conditions. Within the last 15 years, Functional Communication Training (FCT) has been utilized to teach children and adults with developmental disabilities more effective and appropriate ways to mand for attention, preferred items, and escape from nonpreferred tasks (Bird, Dores, Moniz, & Robinson, 1989; Carr & Durand, 1985; Durand & Carr, 1987; Durand & Crimmins, 1987; Durand & Kishi, 1987; Horner & Budd, 1985). This approach involves assessing the function of problem behaviors and then teaching alternate, more socially appropriate, replacement behaviors (Durand & Merges, 2001).

The current literature on FCT for challenging behaviors maintained by negative reinforcement has been devoted to teaching re-

quests for escape from undesired activities or demanding tasks (e.g., Carr & Durand, 1985; Day, Horner, & O'Neill, 1994; Durand & Carr, 1991; Kennedy, Meyer, Knowles, & Shukla, 2000), but not nonpreferred objects or items. However, people with disabilities, like the typically developing population, have a variety of reasons to protest: to request a break from a demanding task ("I want to stop now"); to protest a nonpreferred action ("Don't touch me"); or to refuse a nonpreferred object ("No thank you, I don't want broccoli"). The latter skill was the focus of the current study.

In the current zeitgeist to teach language skills to children with autism, various verbal repertoires are taught including duplids, tacts, intraverbals, and mands. Manding is one of the first skills taught as it is one of the first verbal repertoires that children acquire (Sundberg & Michael, 2001). Mands are divided into two subcategories: mands that access positive reinforcement and mands that result in the avoidance or removal of aversive or nonpreferred stimuli. Mand training literature focuses primarily on manding for positive reinforcement. The general procedure for positive reinforcement manding entails presenting a preferred item to the child and prompting an appropriate response to request the preferred item. Once the appropriate request response is made, the preferred item is provided. This procedure is widely recognized and outlined by many au-

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thors and the area of positive reinforcement manding is well-documented and empirically validated (Alwell, Hunt, Goetz & Sailor, 1989; Carr & Kemp, 1989; Chambers & Rehfeldt, 2002; Charlop, Shreibman, & Thibodeau, 1985; Frost & Bondy, 2002; Grunsell & Carter, 2002; Leaf & McEachin, 1999; Shafer, 1994; Simic & Bucher, 1980; Sundberg & Partington, 1998; Taylor & McDonough, 1996; Tirapelle & Cipani, 1992).

In contrast, the literature on manding for negative reinforcement of nonpreferred items is limited. While the importance of teaching negatively reinforced manding is often discussed and a general strategy for teaching is provided (e.g., the aversive stimulus is presented and the correct mand response reinforced by the termination of the aversive stimulus), a step-by-step procedure for teaching this skill is rarely provided (Leaf & McEachin, 1999; Rappaport, 1996; Sundberg & Michael, 2001; Sundberg & Partington, 1998).

Two detailed procedures to teach manding for the removal of nonpreferred items were found in the literature (Dyer & Kohland, 1991; Frost & Bondy, 2002). Dyer and Kohland (1991) taught nonvocal children to hand back a nonpreferred item using a detailed training protocol. In brief, the child was presented with a nonpreferred item. If the child appropriately refused (i.e., handed back the item), the trainer reinforced the child's behavior by removing the nonpreferred item and allowing the child to play with a preferred activity. If the child did not hand back the nonpreferred item or inappropriately responded, a prompting hierarchy was implemented to teach the child the appropriate mand response. There are limitations to the Dyer and Kohland (1991) work, however. First, their refusal procedure has not been empirically validated in formal studies. Additionally, the refusal response of handing back a nonpreferred item assumes the child's willingness to touch the nonpreferred item, which may not be a useful assumption when working with children diagnosed with autism as they often demonstrate tactile defensiveness (Baranek, Foster, & Berkson, 1997; Sears, 1981).

Frost and Bondy (2002) also provided a detailed strategy to teach manding for the removal of nonpreferred items. They taught children to shake their heads "no" to refuse items when asked specifically about the items (e.g., "Do

you want chips?"). While shaking one's head is a universal way to refuse something, there are limitations to this procedure. First, the refusal response was taught in a limited context. Children were taught to shake their heads when asked if they wanted an item. However, children are often handed things without first being asked if they want them. It is unclear which stimulus controls the "no" response when using this procedure: the verbal cue ("do you want . . .?"), the presence of the item, or a combination of the two. Moreover, more empirical work is needed to fully demonstrate the efficacy of Frost and Bondy's procedure.

The importance of teaching children with autism and other disabilities appropriate protest or refusal responses should not be underestimated. Teaching children a more appropriate way to refuse has tremendous social validity for individuals and their families. If a more appropriate refusal or rejection response can be taught rather than the individual engaging in challenging behaviors, the quality of life is not only improved for the individual but for his/her family as well. Moreover, while children are expected to comply with reasonable adult requests and commands, an exclusive focus on compliance may leave children vulnerable. Rates of abuse are reportedly higher for individuals with disabilities than for those without disabilities (Petersilia, 2001; Muccigrosso, 1991). As such, an individual's ability to appropriately refuse or protest nonpreferred items or activities also may be vital to self-protection.

Using a multiple baseline design across participants, this study sought to extend the literature in this area by answering two questions: "Can children with autism be taught more socially appropriate ways to spontaneously refuse an item and thus, decrease occurrences of challenging behaviors?" And if so, "Can appropriate refusal responses be generalized to untrained nonpreferred items?"

## METHOD

### *Participants*

Three children between the ages of 8 and 11 years participated in the study. All 3 participants (OE, SA, and LH) had a diagnosis of autism and lived at home with their parents.

OE was an 8-year-old Iranian-American boy. He was receiving one-to-one discrete trial instruction in the home setting from a nonpublic agency. OE's verbal repertoire consisted largely of pointing and leading others, and when prompted he had some two- and three-word mands. OE's negatively reinforced mands entailed such behaviors as giggling/laughing, stomping, pinching, slapping, and pushing. OE took over-the-counter allergy medications, but no prescribed medications.

SA was an 11-year-old boy of Caucasian descent who attended public school. He was in a fifth grade general education classroom and was accompanied by an instructional aide throughout the school day. He also received speech therapy, adaptive physical education, and occupational therapy at school. Prior to participation in this experiment he had received one-to-one discrete trial instruction from a nonpublic agency for two years. SA's verbal repertoire consisted of signing and he could sign two- to three-word phrases. His signs were modified, however, due to his limited fine motor abilities. SA's negatively reinforced mands entailed such behaviors as biting, slapping/flapping hands, and pushing. SA was not prescribed any medications.

LH was an 8-year-old girl of Caucasian descent who attended a combination first- and second-grade classroom at a nonpublic school where she was accompanied by a one-to-one aide throughout the school day. LH received speech therapy and occupational therapy at school and one-to-one discrete trial instruction in the home setting from a nonpublic agency. LH was vocal and her verbal repertoire consisted of full-sentence mands. Her negatively reinforced mands entailed such behaviors as crying/whining, covering ears, and pushing. LH was not prescribed any medications, but was on a gluten-casein free diet.

#### *Setting and Materials*

The experiment was conducted in the participants' homes. Sessions were conducted with the principal investigator sitting across from the participants (with knees 20 to 31 cm away from the participant) and with a table positioned to either the left or right side of the participant and the first author.

OE's sessions were conducted in the living room at a plastic folding table (102 cm by 71

cm) with two plastic lawn chairs. SA's sessions were conducted in the dining room at a wooden dining table (183 cm by 114 cm) with two wooden chairs. LH's sessions were conducted at a plastic child's table (71 cm by 71 cm) with two chairs in the room where her one-to-one discrete trial instruction also occurred.

A digital watch with a second timer and a digital kitchen timer were used as time keeping devices. All phases of the experiment were videotaped using a Canon NTSC ZR 65 MC Digital Video Camcorder. The camera was set on a tripod in a corner of the room. The video included a second-hand timer.

Other materials included participants' identified nonpreferred items. For OE, bite-sized pieces of raw carrots, raw broccoli, hard-boiled eggs, watermelon, bananas, baked potatoes, corn, apples, tomatoes, and cucumbers were used. For SA, bite-sized Starburst fruit chews, Reese's Peanut Butter Cups, Twix candy bars, Lifesavers candy, bananas, tomatoes, raw carrots, chocolate chip cookies, baked potatoes, and hard-boiled eggs were used. For LH, the nonpreferred items were toys that made noise or played music, including a Little Tikes drum with drumsticks, a maraca, a xylophone, a tambourine, jingle bells, paper horns, clackers, a plastic flute, a whistle that sounded like a fire truck bell, and a sports whistle.

#### *Response Definitions*

*Challenging behaviors.* Target challenging behaviors were the pre-intervention operant responses that the children engaged in to refuse the nonpreferred items.

For OE, the behaviors were defined as follows:

1. Giggling/Laughing: a series of undulating sounds while smiling. Does not include the repetition of the same sound while smiling (e.g., saying "eee" while smiling). The sound can be heard from up to 186 cm away.
2. Stomping: any sound made with feet. The sound can be made with one foot or both feet, and while the participant is standing or sitting. The sound can also be made while walking, running, or standing in one place and can be heard from up to 186 cm away.
3. Pinching: taking fingers (two or all fingers)

and squeezing into/around another person or self.

4. Slapping: using one or two hands to make contact with another person, object, or self. The action is accompanied by a sound, which can be heard from up to 186 cm away.
5. Pushing: using hand or forearm to move another person's hand or body away.

For SA, the behaviors were defined as:

1. Biting: teeth or mouth coming in contact with own body or clothing or another person's body or clothing.
2. Slapping hands: hands coming in contact with each other such that a sound is heard from up to 186 cm away.
3. Flapping hands: moving or shaking one or two hands.
4. Pushing: using hand or forearm to move another person's hand or body away.

For LH, the behaviors were defined as:

1. Crying/whining: a series of undulating sounds or short burst of sounds while frowning. Does not include laughing or giggling. The sound can be heard from up to 186 cm away.
2. Covering ears: placing hands (one or both) on ears or using shoulders/arms to cover ears. While this behavior would not technically be considered challenging, LH's parents preferred that she be taught a more conventional mand (i.e., vocal language) to refuse nonpreferred items—covering ears did not allow LH to effectively influence her social environment.
3. Pushing: using hand or forearm to move another person's hand or body away.

*Target replacement behaviors.* The target replacement behaviors were the mand responses taught to the participants that would obtain negative reinforcement. For OE, the mand response was vocalizing, "No thanks." For SA, it was signing "No" by opening and closing his fingers and thumb similar to the opening and closing of a bird's beak. For LH, the mand was vocalizing, "No, don't do that." To ensure that these responses would be reinforced and thus maintained in the natural environment, they were chosen in collaboration with the children's families.

### *Recording Systems*

A continuous 10-second partial interval time sampling method was used to record challenging behaviors and target replacement behaviors during the analogue assessments. During the baseline, mand training, and during generalization probe phases of the experiment a trial-based coding system was used. This system required coding of the challenging behaviors at the time that the participants were presented with the nonpreferred items, but not during intertrial intervals.

### *Experimental Design*

A multiple baseline design across participants was used. The experimental conditions included analogue assessment, baseline, mand training, and generalization probe sessions. The targeted challenging behaviors and replacement mand responses were measured during all phases of the experiment.

### *Procedure*

*Parent interview.* Nonpreferred items were identified for each participant via a parent interview, which asked the parents to identify 10 items that their child did not like or avoided.

*Analogue assessment.* After the list of nonpreferred items was generated, a brief analogue assessment was conducted (Northup et al., 1991) to determine the function of the targeted challenging behaviors and to verify the aversiveness of identified nonpreferred items. The three social analogue conditions were conducted (e.g., escape, attention, tangible) and each analogue condition lasted 10 minutes. A 5-minute break was given between each condition. A set of all three analogue conditions were presented in random order. The analogue assessments verified that the challenging behaviors for all three participants primarily served an escape function, as the challenging behaviors were demonstrated significantly more in the escape condition than in the other two conditions and confirmed that the nonpreferred items identified by the parents were aversive stimuli.

*Baseline.* Each baseline session was 10 minutes in length and as many as three baseline sessions were conducted in a day. The nonpreferred items identified for the partici-

pant were presented in random order. While sitting across from the participant at the table and chair, the principal investigator presented the first of the selected nonpreferred items by holding it up directly in front of the participant (15 to 20 cm away from the participant's face), by placing the items on the participant's lip, or by playing the musical instruments. This signaled the start of the trial. Contingent upon the participant engaging in the challenging behaviors, the principal investigator negatively reinforced this response by taking the item away from the participant. The removal of the item signaled the end of the trial. If the participant did not engage in the target challenging behaviors, the nonpreferred item was removed after 10 seconds elapsed from the onset of the trial. After the item had been removed, the principal investigator waited for 30 seconds before starting the next trial. During the inter-trial interval, the participant was allowed to leave his/her seat. This format continued until all 10 nonpreferred items had been presented.

*Mand training.* Each mand training session lasted 10 minutes and was comprised of 10 to 12 trials. No more than three sessions were conducted in a day. A 5-minute break was provided between each 10-minute training session. Mand training consisted of teaching the participants the appropriate mand response for 3 of the 10 identified nonpreferred items. The three training items were picked at random and presented in random order.

#### *Prompting Procedure*

*Prompts for teaching the mand response.* The prompts provided to the participants to teach the new replacement responses varied depending on the participant and the mand response being taught. The prompting procedures were individualized for each child based on their verbal repertoires and the types of prompts proven to be effective for each child.

For OE, upon the presentation of the nonpreferred stimuli, the prompting hierarchy was as follows: (1) Level 1—the vocal instruction, "Say, no thanks," was provided; and (2) Level 2—an expectant look was given (i.e., eyebrows raised).

For SA, upon the presentation of the nonpreferred stimuli, the prompting hierarchy was as follows: (1) Level 1—the vocal instruction, "Sign no," was provided; (2) Level 2—the

sign for "no" was modeled; and (3) Level 3—an expectant look was given (i.e., eyebrows raised).

For LH, upon the presentation of the nonpreferred stimuli, the prompting hierarchy was as follows: (1) Level 1—the vocal instruction, "Say, no, don't do that," was provided; (2) Level 2—the vocal instruction, "Say no . . .," was provided; (3) Level 3—the vocal instruction, "Nnn . . .," was provided; and (4) Level 4—an expectant look was given (i.e., eyebrows raised).

*Other strategies used.* Two additional strategies were implemented. A time delay procedure was used to minimize the occurrence of the challenging behavior. The nonpreferred item was held where the participant could see it (approximately 31 cm away from the participant's face) for 4 to 5 seconds. This procedure also gave the participant the opportunity to mand to avoid coming into contact with the nonpreferred item rather than always manding to escape contact with it.

A physical prompt to prevent the participant from engaging in the challenging behaviors was also used. This entailed holding the participants' hand down and was sometimes accompanied by a vocal instruction (e.g., "Hands down").

The need for these additional strategies was identified during the generalization probe sessions for OE after mand training sessions with training items were completed. Thus, these procedures were used with OE only during the additional mand training sessions after the generalization probes. With LH and SA, these procedures were used throughout all mand training sessions.

#### *Training of the First Item*

While sitting across from the participant at the table and chair, the investigator (first author) presented the first nonpreferred training item as described in the baseline section. The training items used in the phase were pieces of apple, pieces of Reese's peanut butter cups, and bells for OE, SA, and LH, respectively. The presentation of the nonpreferred item signaled the start of the trial. Immediately upon presenting the nonpreferred item, the prompting hierarchy was implemented beginning with a Level 1 prompt. A "most-to-least" prompting strategy was used in this phase because the mand response was not in the participants' repertoire.

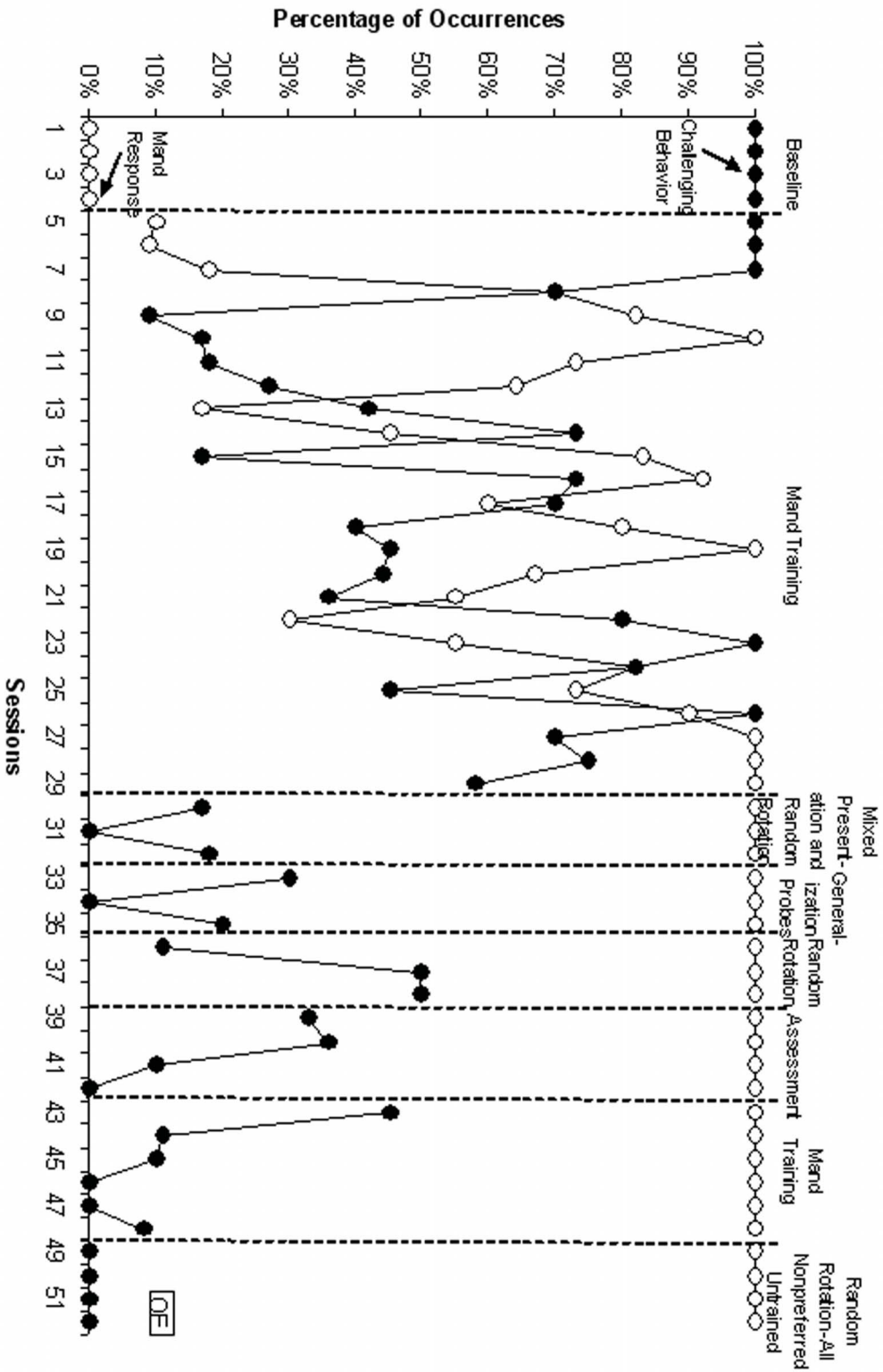


Fig. 1. Percentage of occurrence of challenging behaviors and mand responses for OE.

Upon exhibiting the mand response, the item was removed and a vocal acknowledgement of the refusal response (e.g., “Oh, okay,” or “Oh, you don’t want it!”) was provided. The removal of the item signaled the end of the trial. During the 30-second intertrial interval the children were allowed to leave their seats. This procedure continued for 8 to 10 trials.

After 8 to 10 trials of correct responding using Level 1 prompting, prompts were faded to Level 2 prompts. If the participant could emit the mand response with Level 2 prompting, trials continued at that level for 4 to 5 trials. If the participant did not emit the mand response with Level 2 prompting, a reversion back to Level 1 prompting occurred for 3 to 5 additional trials before fading to Level 2 prompts again. This fading procedure continued until participants emitted the mand response independently. The time delay procedure and physical prompts to prevent the occurrence of challenging behaviors were utilized as necessary throughout this phase of the study. When mands were emitted independently and when challenging behaviors were absent for five consecutive trials, training for the second nonpreferred item began.

#### *Training of the Second Item*

The training items used in this phase were pieces of broccoli, pieces of Twix bars, and maracas for OE, SA, and LH, respectively. The procedure for training the second item was the same as for the first item with one exception. A “least-to-most” prompting strategy was used for the mand response in this phase of the study because the mand response was now in the participants’ repertoires. Therefore, if the participant did not mand independently upon presentation of the nonpreferred item, an expectant look was provided. If the participant did not mand with that prompt, the next level prompt was provided (i.e., Level 1 for OE, Level 2 for SA; Level 3 for LH, etc.). Movement up the hierarchy, from the least to the most intrusive prompt, occurred until the mand response was emitted. Prompt fading occurred as described in the section on training for the first item. The time delay procedure and physical prompts to prevent the occurrence of challenging behaviors were utilized as necessary throughout this phase of the study. When mands were emitted independently and when

challenging behaviors were absent for five consecutive trials, training for the third nonpreferred item began.

#### *Training of the Third Item*

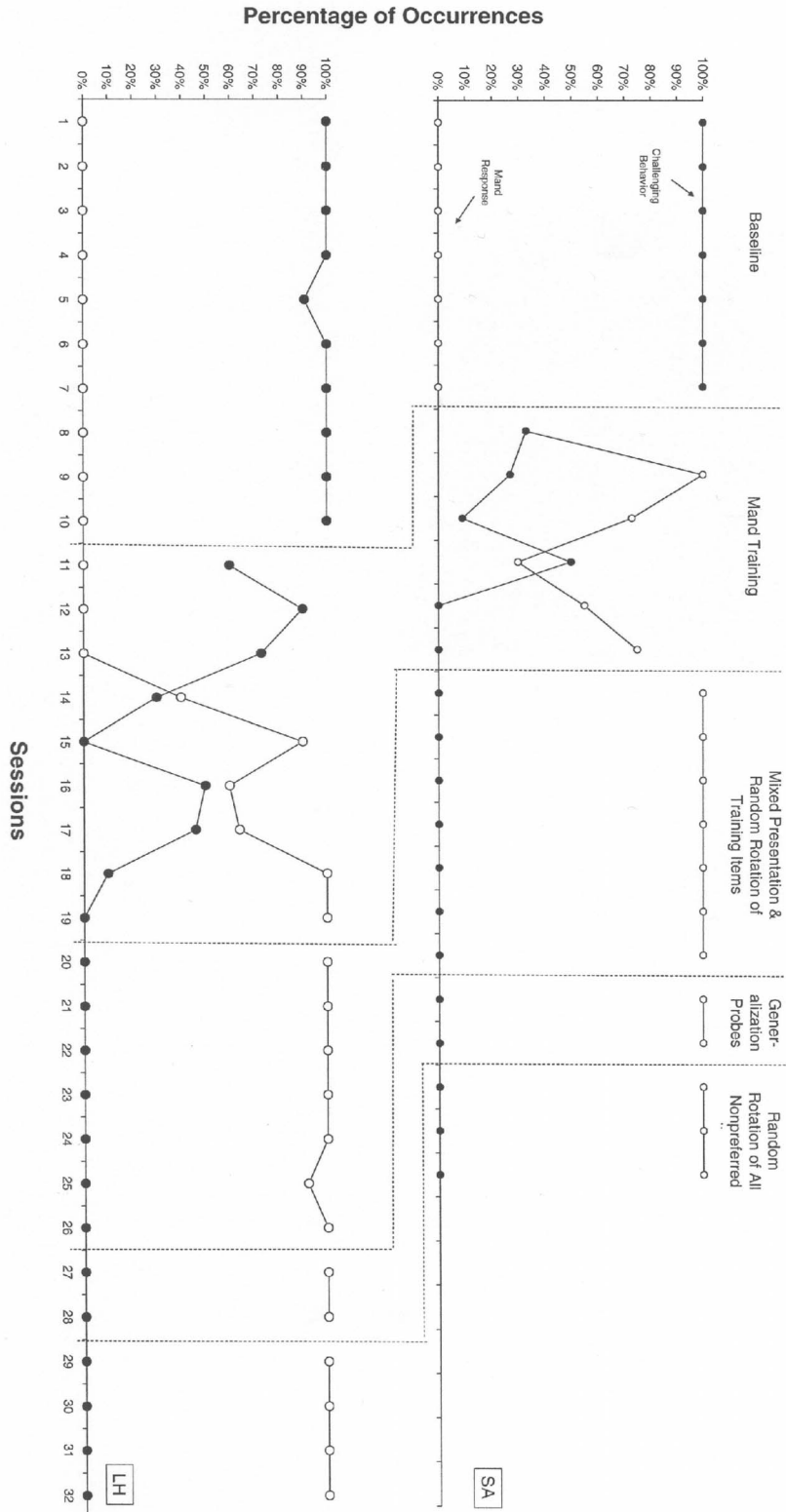
The third teaching item was taught in the same manner as with item 2. The training items used in the phase were pieces of carrot, pieces of Starburst chews, and a fire truck whistle for OE, SA, and LH, respectively. The principal investigator again faded the prompts as with items 1 and 2. The time delay procedure and physical prompts to prevent the occurrence of challenging behaviors were utilized as necessary throughout this phase of the study. When mands were emitted independently and when challenging behaviors were absent for five consecutive trials, the mand responses for the three training items were then assessed for mastery.

#### *Mixed Presentation and Random Rotation of Training Items*

During this phase, items were initially presented in blocked trials where the first item was presented for 2 to 3 trials and then the second item for 2 to 3 trials and finally the third item for 2 to 3 trials. When the participant correctly responded on 85% or more of the blocked trials, the training items were then presented in random rotation.

Originally, mastery was defined as the participant independently manding at rate of 90% above baseline levels and engaging in challenging behavior at 70% below baseline levels in the random rotation phase. The mastery criteria had to be demonstrated for at least one session, across three consecutive days and the participant had to respond correctly on the first trial each of the three days.

To ensure that the results of this study were meaningful to the family (i.e., had social validity), the mastery criteria were shared with the participants’ parents. Based on their feedback, the mastery criteria became more stringent. The revised definition of mastery was independent manding at a rate of 90% above baseline levels and 0% occurrences of challenging behaviors. Mastery had to be demonstrated for a minimum of at least one session across three consecutive days and the participant had to respond correctly on the first trial of each of the three days.



**Fig. 2.** Percentage of occurrence of challenging behaviors and mand responses for SA and LH.



*Generalization probes.* After mastery was achieved for the training items, generalization probes were initiated with the seven nonpreferred items that were not used in training. These nonpreferred items were presented in the same format described in baseline. Generalization trials were terminated for three possible reasons: (1) the participant engaged in the mand response; (2) the participant emitted challenging behaviors, but not the mand response; or (3) the participant manded and engaged in challenging behavior. If the participant did not emit the mand response when presented with the untrained nonpreferred items or continued to engage in challenging behaviors, mand training was conducted until the participant emitted the mand response without engaging in the challenging behaviors.

#### *Interobserver Reliability*

Interobserver reliability was assessed in 33% of all mand training sessions and generalization probe sessions. The formula for calculating the interobserver agreement index was the number of agreements divided by the number of agreements plus the number of disagreements multiplied by 100. Reliability was conducted on an interval-by-interval and trial-by-trial basis. The interobserver agreement coefficient in the mand training sessions averaged 97% with a range of 90 to 100%. In the generalization probe sessions, the interobserver agreement coefficient averaged 98% with a range of 98 to 100%.

### RESULTS

#### *Participant OE*

Figure 1 shows the results of the intervention on OE's challenging behavior and manding. During baseline, OE refused nonpreferred items by engaging in the challenging behaviors in 100% of trials and emitted the targeted mand response in 0% of the trials.

During mand training, OE's behavior was quite variable. Manding occurred an average of 66% of the time with a range of 9 to 100% and challenging behavior occurred an average of 60% of the time also with a range of 9 to 100%. Training sessions were initially conducted once or twice per week, but after OE's

variable performance was evident, a decision was made to hold daily sessions for the remainder of the mand training phase.

During the mixed presentation and random rotation phase, OE manded 100% of the time and engaged in challenging behaviors 20% or less of the time. Interestingly, during the mixed trials sessions OE began eating the apple pieces when they were presented so random rotation trials and generalization probes only assessed mastery for the two remaining training items. Using the original mastery criteria of manding at 90% above baseline and a 70% reduction in challenging behaviors, it was determined that OE had fully mastered the training items and generalization probes began.

Three generalization sessions were conducted with OE using the remaining seven nonpreferred items identified by his parents. OE emitted the mand response in 100% of generalization sessions. His challenging behaviors were emitted in an average of 17% of sessions (range 0-30%). These results indicate that the mand response had generalized to the untrained items and that challenging behaviors were maintained at mastery level. However, when random rotation of all items (trained and untrained) began, OE's challenging behaviors began to increase (e.g., 50% of the time in sessions 37 and 38).

An assessment phase was implemented in an effort to determine why OE was engaging in more challenging behaviors. A trial-by-trial analysis indicated that OE engaged in more challenging behaviors when presented with soft-textured food items. Thus, additional mand training sessions were conducted with those soft-textured items. The time delay procedure and the physical prompt were employed during these additional mand training sessions. During the random rotation phase, the more stringent mastery criteria of 90% manding and 0% challenging behavior were put into effect. However, OE surpassed the more stringent mastery criteria by engaging in manding 100% of the time and in challenging behaviors 0% of the time during the random rotation of all nonpreferred items (sessions 49 to 52).

#### *Participant SA*

Figure 2, top panel, presents the results of intervention on the behavior of SA. During baseline, SA engaged in challenging behavior

in 100% of the sessions and emitted the mand response in 0% of the sessions.

During mand training, sessions were conducted twice per week. Based on what was learned from OE's participation in the study, the time delay procedure and physical prompting strategy were to be employed during mand training to allow SA the opportunity to avoid contact with the nonpreferred items. However, SA only needed the time delay procedure to reduce instances of challenging behaviors. During mand training, SA emitted the mand response an average of 62% of the time (range 33-100%) and exhibited challenging behavior an average of 20% of the time (range 0-50%). During the mixed presentation and random rotation phase, SA manded 100% of the time and engaged in challenging behaviors 0% of the time.

Two generalization sessions were conducted with SA using the remaining seven nonpreferred items identified by his parents. Again, SA emitted the mand response in 100% of generalization sessions and he did not exhibit challenging behavior in any of the sessions. These results indicate that the mand response had generalized to the untrained items and that challenging behaviors had been eliminated.

In the last random rotation phase, all 10 nonpreferred items were assessed for mastery. SA's performance surpassed the more stringent mastery criteria established with continued manding 100% of the time and challenging behaviors occurring 0% of the time.

#### *Participant LH*

Figure 2, bottom panel, displays the results of intervention on the behavior of LH. During baseline, LH engaged in challenging behavior in virtually 100% of the sessions and emitted the mand response in 0% of the sessions.

During mand training, sessions were conducted once per week. Both the time delay procedure and the physical prompting strategy were implemented with LH. During this phase, LH emitted the mand response an average of 50% of the time (range 0-100%) and exhibited challenging behavior an average of 40% of the time (range 0-90%).

During the mixed presentation and random rotation phase, LH manded 100% of the time in all but one session and engaged in challeng-

ing behaviors 0% of the time. Interestingly, in session 25 LH reached for the nonpreferred item being presented (the bell) and needed a prompt to emit the trained mand response. Reaching was not a defined challenging behavior and so the session was scored as a trial in which the mand response was prompted.

Two generalization sessions were conducted with LH using the remaining seven nonpreferred items identified by her parents. LH emitted the mand response in 100% of generalization sessions and she did not exhibit challenging behavior in any of the sessions. These results indicate that the mand response had generalized to the untrained items and that challenging behaviors had been eliminated.

In the last random rotation phase, all 10 nonpreferred items were assessed for mastery. LH's performance surpassed the more stringent mastery criteria established with continued manding 100% of the time and challenging behaviors occurring 0% of the time.

## DISCUSSION

This study was conducted to empirically assess a method for teaching children with autism to replace their challenging behaviors with more appropriate ways to spontaneously refuse nonpreferred items. The study also sought to determine whether the mand response would generalize to untrained nonpreferred items.

The results of the experiment indeed verified that children with autism could be taught a more appropriate refusal response which then generalized to untrained nonpreferred items. Although OE took longer to learn the mand response than did SA and LH, all three participants learned and generalized the mand response while significantly decreasing the frequency of challenging behavior.

In the process of training the mand response, some interesting findings were noted. First, generalization proved more difficult for the most aversive items. For instance, while OE's mand response was generalized to soft-textured items, he continued to engage in challenging behaviors when those items were presented. These soft-textured items were verified by his mother to be his least favored items. Similarly, during LH's mand training, she emitted the mand response in the presence of the second training item (i.e., maracas) with the least intrusive prompt and quickly learned to mand

independently. However, when the third training item (i.e., fire truck whistle) was introduced, she immediately engaged in challenging behaviors and needed more intrusive prompts to emit the mand response. The third item appeared to me more aversive than the second one. It appears that for these two participants, these aversive items were powerful antecedents that set the occasion for challenging behavior and impeded immediate generalization of the newly learned mand response.

Second, in the Results Section, it was noted that OE began eating the apple during the mixed trials sessions of the experiment. The study suggests research in the area of food aversion and teaching tolerance of nonpreferred items. Perhaps children with food aversions are more likely to eat items similar in texture to other favored items. OE found soft-textured foods extremely aversive. Thus, when expanding a repertoire of food items, it might be better to start with items similar to already preferred items. For OE, it was solid, crunchy foods. Also, perhaps multiple repetition of a nonpreferred item (i.e., desensitization) is first necessary before beginning to expand a child's diet with that item. OE eating the apple also suggests future research investigating variables involved in teaching children how to refuse actions or teaching children to discriminate the conditions under which a refusal response is appropriate and when it is not appropriate for a favored item (e.g., changing establishing operations).

Third, Frost and Bondy (2002) noted that when teaching children to refuse nonpreferred items, one should refrain from presenting the same item on consecutive opportunities. They stated, "Doing this is not sensible . . . from the child's perspective it would seem that you didn't understand or remember his previous response when he indicated 'no!'" (p. 250). However, the consecutive presentation of the nonpreferred items did not prove difficult for the participants in this study. This may have been a by-product of the children's instructional histories. That is, having all received discrete trial instruction; the participants were very compliant to instructions and tolerant of consecutive presentations of the same stimuli. Further research is needed to determine whether an individual's instructional history influences the effectiveness of this procedure.

Fourth, LH's and OE's mothers noted that

subsequent to the study, both children demonstrated response generalization as well as stimulus generalization. OE's mother reported that on one occasion, OE refused a banana by saying, "No banana" rather than "No thanks," which was the trained response. Similarly, LH's mother reported that in one instance, LH's nanny was about to wrap her in her bathrobe and she refused it by saying, "No bathrobe" instead of "No, don't do that," which was the trained response.

Fifth, it was important to all three families that their children continue to use the newly learned mand response in new situations. At their request, a specific format was outlined for the families to ensure that generalization of the mand response to other people, other settings/contexts, other items, and other actions occurred and that the newly acquired response was maintained over time.

There are some potential limitations to this study. First, the teaching procedure was changed after mand training was implemented with OE. After OE's participation, the time delay and physical prompting strategies were introduced. While mand training procedures should have remain consistent across all participants, the addition of these strategies represented a refinement of the mand training procedure and resulted in a higher rate of manding and lower rate of challenging behavior more quickly.

Limitations to the generality of the mand response also existed. Although parent report indicated that the newly acquired mand responses were generalized to novel nonpreferred *items*, informal probes for generalization to nonpreferred *actions* did not yield favorable results. For SA and LH the mand response did not occur with respect to novel nonpreferred actions (e.g., rubbing SA's head with knuckles or messing up LH's hair). Future research is needed in this area.

The most significant limitation of this study may be that it was conducted with a very specific population of children. Not only did all the children have a diagnosis of autism, but they had all received intensive discrete trial instruction. Perhaps the children's instructional histories contributed to the positive results. Perhaps participants with different diagnoses or different learning histories will show different outcomes. Only further investigation can provide such answers.

In summary, this study demonstrated that children with autism could acquire appropriate mands for the removal of nonpreferred items, and this behavior replaced the challenging behaviors that had previously served this purpose. Moreover, as anecdotally reported by the children's parents, learning the mand response led to quality of life improvements for all participants and their families because the participants no longer engaged in challenging behaviors to refuse nonpreferred items. This study contributes to the field of negatively reinforced manding and functional communication training by defining the procedures for teaching negatively reinforced manding of objects and by pointing to areas of possible future research.

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