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Mands are a building block for all communication and are therefore important to teach to individuals who do not consistently use mands. Skinner defined a mand as a "verbal operant in which the response is reinforced by a characteristic consequence and is under the control of relevant conditions of deprivation or aversive stimulation" (Hall & Sundberg 1987). By providing individuals with a way to express their desires and needs, individuals display less problem behaviors. A functional form of communication is imperative to typically developing children and children with autism spectrum disorders alike. The goal of the current study was to increase the frequency of manding as well as the variety of mands in a naturalistic teaching format. Through the manipulation of the environment, and the implementation of prompts, researchers were able to train an echoic into a mand and generalize those mands to a more natural environment. The study began by teaching mands in a discrete-trial setting, using four phases to increase independent responses; upon mastery, the study was implemented in a naturalistic setting for maintenance. By the end of the study, the individual showed significant differences from baseline.

Key words: autism, mands, communication

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Introduction

A child who does not have developed language skills, can encounter difficult situations when they need something but are unable to appropriately express it. From birth, humans find a way to ask for things: it can be the cry of a baby, the pointing finger of a toddler, or the use of words to ask. These methods of communicating a request are known within the behavior analysis community as mands; a mand is when a speaker expresses what they need or want (Sundberg, 2007). If an individual is unable to express their needs in a way that is understood, some problem behaviors may occur due to the lack of effective communication. Problem behaviors can have a harmful effect on an individual's life; therefore, it is important to minimize problem behaviors when possible.

One method of teaching appropriate communication is functional communication training, which uses differential reinforcement to teach individuals an appropriate response that will allow them to receive the same reinforcement that maintains problem behavior (Tiger, Hanley & Bruzek, 2008). Teaching functional methods of communication not only gives individuals the opportunity to communicate in a way that is understood, but also reduces the need for problem behavior as a mode of communication. According to Plavnick and Ferreri (2012), it has long been assumed that mand training can prevent the development or worsening of problem behavior. Implementing an intervention that teaches appropriate mands as well as decreases problem behavior, would be very beneficial to the participant.

Formal mand training is implemented to increase and shape mands in a child to foster more effective communication. Mand training is essential to verbal behavior training, particularly if the individual lacks the manding skill (Albert, Carbone, Murray, Hagerty & Sweeney-Kewin, 2012). If an individual has the ability to emit vocalizations, it is important to

maximize the use of those vocalizations and shape them into functional vocalizations. Albert et al. 2012, found that the use of echoic mand training resulted in consistent vocal responses when using an interrupted chains procedure.

One specific type of mand training that has proven effective is the mand-model procedure. The mand-model procedure focuses on the generalization of previously acquired language; learning opportunities are initiated by both the learner and the therapist (Le Blanc, Esch, Sidener & Firth 2006). The mand-model procedure modifies incidental teaching, using a prompt of the targeted response after the participant selects the target from an array of preferred items. The mand-model procedure uses naturalistic language strategies as well as corrective feedback to increase verbal mands.

The implementation of a mand-model procedure in a naturalistic setting encourages a higher probability of generalization and spontaneity. Warren, McQuarter and Rogers-Warren (1984), found that through the use of the mand-model procedure, they could consistently increase responsiveness as well as the mean length of utterances (MLU) for each participant. The study was also implemented in a naturalistic setting and increased total child verbalizations within the implementation and showed maintenance following the intervention. By pairing the mand-model procedure with the altering of an individual's environment and the use of stimulus control, researchers are able to use interventions to teaching vocal mands.

There is evidence that reveals that social participation of children with ASD can be enhanced through teaching them spontaneous communication. Through the use of a stimulus control transfer procedure, Ward and Mehta (2019), were able to increase generalizations and spontaneity of motivation controlled mands. Mands that are controlled by motivation are the truest mands a person can emit, as it is directly related to what they want or need.

The purpose of this study was to increase the rate of independent vocal mands in a child with autism, as well as increase the variety of mands while using a naturalistic teaching format. Functional communication is essential to building beneficial social skills; teaching a child to functionally mand for items would increase their verbal repertoire. The implementation of mand training is also likely to decrease undesirable behaviors as a collateral effect of functional communication. The use of a naturalistic format was used to increase the likelihood of generalization following the completion of this research. This study includes a maintenance period to assess generalization across multiple targets and settings.

Methods

Participants

The participant for this study was a 3-year-old female with an educational diagnosis of autism spectrum disorder. She could reliably echo sounds, words, and phrases; and her repertoire contained some non-specific mands. The participant was able to mand independently prior to the start of this study, however, independent mands were inconsistent. This participant was selected due to the shapeable vocalizations and the ability to consistently echo sounds. Prior to the intervention, the participant did display behaviors such as aggression, in the form of hitting.

Setting

The study was conducted in a preschool classroom at Kalamazoo Regional Educational Service Agency West Campus (KRESA). This specific classroom was an early childhood special education classroom, where graduate and undergraduate students from a nearby university provided one-on-one applied behavior analysis with the students in the classroom. The classroom was organized into booths for each student where discrete trial training occurred, but there were also common areas to promote natural environmental teaching. Initially, sessions of this study

took place at the common table where students would eat breakfast, but then locations varied to different tables or booths to promote generalization.

Materials

For the study, a table was necessary for the initial sessions, yet upon reaching different phases, a table was no longer necessary. Reinforcers were a combination of tangible and edible items. Reinforcers were determined through a multiple-stimulus without replacement preference assessment as well as a forced-choice preference assessment. The reinforcers identified for this study were muffins, fruit snacks, Cheez Its, Starbursts, Skittles, and cookies; none of the reinforcers selected were consistently manded for independently by the participant. Data were collected using pencil and paper and results were graphed using Microsoft Excel.

Research Design

A single-subject A-B design was used across the multiple targeted mands to teach the participant to mand independently through the use of an echoic-to-mand procedure. Using a multiple-baseline design allowed the researcher to examine rates of acquisition, as well as allowed the participant to perform at different levels for different targets. Depending on motivation levels throughout the morning, certain targets displayed varying progress. Sessions were conducted as early as possible within the student's school day to maximize motivation and avoid satiation.

Procedures

Dependent Variable

The dependent variable is the percentage of correct mands emitted. This was determined by the number of correct responses in a session. Correct responses were echoic vocalizations emitted after the provided prompt; this was defined as an approximation of the desired target. A

full echo of the desired response was considered a dependent variable as well. Data were collected for correct, incorrect and independent responses for each trial. All sessions were conducted by the experimenter who was familiar with the procedure and used a consistent method of data collection throughout the study.

Independent Variable

The independent variable was the mand training procedure: the echoic-to-mand with a progressive time delay. The target items used within this procedure were Cheez Its, cookie, fruit snacks, muffins, Starbursts. The study had also originally included the use of skittles, yet the participant did not show interest in skittles after baseline sessions were conducted. Cookie was added as a target a month into the study; the participant had seen another student eating a cookie and displayed interest.

Baseline

Baseline data were collected for each of the edibles targeted. Each session consisted of five to ten trials. Sessions ended after ten trials were reached, or the experimenter ran out of edibles. A forced-choice preference assessment was conducted periodically throughout the session to ensure there was motivation for the target item; the preference assessments were informal and were conducted randomly, or when the participant seemed to lose motivation. Once the target item was selected, the item was held in front of the participant for five seconds. If the participant engaged in a vocal mand for the item it was delivered immediately. If there was no independent mand for the item, the participant was required to imitate 1-2 motor actions to receive the target item. If the child indicated that they were not interested in an item, through a verbal “no” or pushing the item away, a new informal preference assessment was conducted. Target items remained in baseline for 1-2 sessions before moving to Phase 1.

Phase 1

When a target item was moved to Phase 1, the item was only provided by the experimenter during the school day. Trials began when the participant indicated they were interested in an edible item. The experimenter conducted an informal preference assessment and conducted the trials dependent on the item selected. An immediate verbal prompt was provided by the experimenter as the item was presented. If the child echoed the prompt within 5 seconds, the item was delivered, and the trial was marked correct. If there was no echo, or there was an incorrect vocalization by the participant, up to two additional prompts were provided. If the child echoed correctly, the item was then provided, but the trial was still marked incorrect. If the child still echoed incorrectly, the experimenter ran 1-2 motor imitation trials and gave a smaller portion of the edible if possible. Phase 1 was considered mastered when the participant correctly echoed 100% of the trials in one session or independently manded for the item in 50% of the trials within the session.

Phase 2

Phase 2 began with two primer trials occurring prior to the start of sessions. The primer trials consisted of an immediate verbal prompt; this was to increase the likelihood of a correct response in the upcoming trials. Primer data were not considered part of the data and were not recorded. Phase 2 was similar to Phase 1 but included a 5-second delay prior to the experimenter's verbal prompt. If the student manded correctly before or after the prompt was delivered, it was marked as correct. If the student emitted an incorrect response before or after the prompt, it was counted as incorrect and up to two additional prompts were delivered. The mastery criteria for Phase 2 required the participant to score 100% for 1 session, or if the child

independently manded for the item for 50% of 1 session. If the participant scored 80% or lower for 2 consecutive sessions, the target was moved back to Phase 1.

Phase 3

Phase 3 contained one primer trial instead of two primer trials; but was otherwise intervention was conducted identically to Phase 2. The criteria for Phase 3 differed from Phase 2: the student was required to score 90% or better for two consecutive sessions or 80% for three consecutive sessions. If the participant scored at 50% or below for two consecutive sessions, the target was demoted to Phase 2.

Phase 4

Phase 4 was similar to Phase 3, except there were no primer trials conducted prior to the sessions. Mastery criteria and demotion criteria were identical to Phase 3.

Maintenance

After a target was mastered in Phase 4, it entered a maintenance phase. The maintenance sessions consisted of five trials, and once 5 pieces of the edible were gone, the session ended for that target. The target items were still only available during sessions and not throughout the school day. Independent mands for the item were still documented if they occurred outside of the session. In the maintenance phase, items were placed in a small box on the table, which slightly obscured the items from sight. The purpose of this maintenance phase was to promote the participant manding for items out of sight consistently, as spontaneity in a natural context is ideal.

Manding for items out of sight

When the items completed the maintenance phase, they moved into to the manding for items out of sight phase. This phase was comparable to a correspondence phase, by testing the

correspondence between the child's mand and what the child selected. The item was first placed in a semi-see through box, and the participant could see the item, but had to mand in order to receive the items. There were only five pieces of the target items in the box. If the participant manded for the item more than five times they were told "___ all gone" and the experimenter offered available targets through a preference assessment. The box was progressively covered in phases to block the items from sight. In the final phase, the items were kept in a fanny pack worn by the experimenter. Responses in the final phase were considered correct if the participant consumed the item that was manded for, and incorrect if the child did not accept the item.

Results

Prior to the implementation of the intervention, it was hypothesized that the use of an echoic-to-mand procedure with a progressive time delay would increase the frequency of vocal mands in a child with autism. The goal of the research was to determine the effectiveness of teaching a child with autism to vocally mand using a progressive time delay. The goal was also for the participant to gain a functional mode of communication to appropriately request items and actions. Prior to the implementation of the procedure, the participant exhibited aggressive behaviors such as hitting people and throwing items. The current study found that the use of the progressive time delay and echoic-to-mand procedure was effective in increasing the frequency of vocal mands as well as increasing the mean length of utterances in reference to the target items.

The participant mastered one vocal mand target over the course of the study. The study originally consisted of 4 targets: Skittles, Cheez Its, muffin, and fruit snack. Skittles were removed from the intervention, as the participant did not have motivation for them, and as a result, a full session was not conducted. Cheez Its were removed after one session of baseline

was conducted, as the participant did not display motivation for Cheez Its. Two additional targets, Starburst and cookie, were added after the removal of two original targets. Starbursts were removed for a month due to low interest and were reimplemented once the participant showed motivation again. Cookie was added to the intervention with Starburst, yet motivation remained high with cookie, and it remained part of the procedure without removal.

The participant showed positive growth throughout the study; approximations were shaped through the echoic-to-mand procedure. Gradually the participant was able to emit more intelligible approximations, as well as mand for items out of sight. The participant's acquisition of the target items are displayed in multiple graphs, according to the specific target, for comprehension.

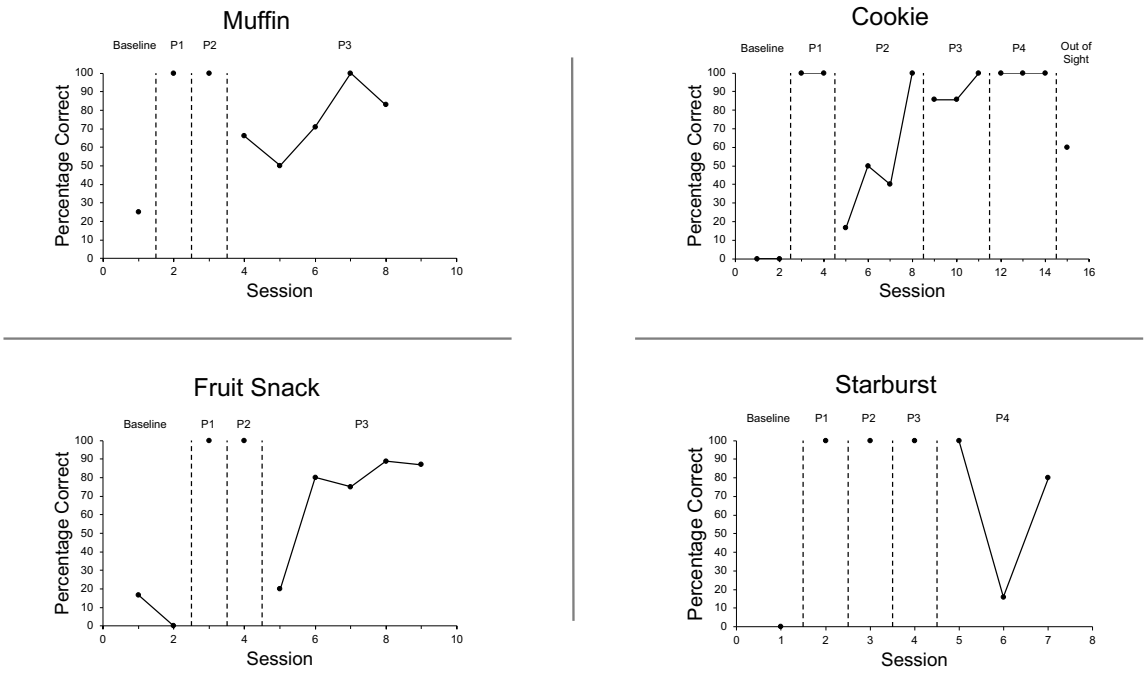

Figure 1. The results of the echoic-to-mand procedure for the participant. P1, P2 and P3 refer to Phase 1, Phase 2, and Phase 3.

Discussion

This study selected an echoic-to-mand procedure with a progressive time delay due to the positive implications of past research. Warren, McQuarter and Rogers-Warren (1984) found evidence that a mand-model procedure can significantly improve the frequency of verbal mands. The current intervention also aimed to use incidental teaching. The experimenter hypothesized that the intervention would increase independent vocal mands emitted by the participant. The data collected throughout the intervention supported the experimenter's hypothesis. Independent vocal mands emitted by the participant increased; the length of utterances emitted by the participant increased over the course of the intervention, as well.

The intervention did require modification upon implementation. The participant had very quickly changing motivation, which required a flexible session format as compared to a structured setting. Sessions began as soon as the participant showed interest in food items; interest was determined by the participant pointing to food or selecting to "eat" when given a choice between eating and another activity. Sessions were then conducted as soon as the participant had motivation and were conducted at the nearest table setting.

The results of the current study were in agreement with previous research. Prior research displayed evidence that participants' mand repertoires, as well as MLUs, were able to increase through the intervention. Due to the similarity in methodology and the participant-initiated design, similar results were hypothesized. The naturalistic format combined with the participant-led design factored into the participant's success in the current study. The current study elaborates on prior research, modifies the intervention to best suit the participant, and adds to the literature on naturalistic programs to teach mands.

Some challenges were experienced over the course of the implementation of the study. The participant's level of motivation for food was extremely variable; the participant was offered

the breakfast provided by the school, and if she chose to eat it, her motivation for target items may have been affected. There was also the possibility that the participant had eaten prior to arriving at school, which would affect the motivation for food items. The participant also was experiencing some issues with sleep over the course of the study. Some days, the participant would arrive at school and immediately mand for "sleep" which was honored, as a decrease in problem behavior was seen when given the chance to sleep. However, the participant's need to sleep affected the time available to run sessions and also may have affected the participant's motivation for food upon waking. The study was conducted in the months of September through March, and the participant experienced frequent illness, which potentially lowered the motivation to consume food items.

A limitation of this study was that the rules of the intervention were only in place when the researcher was present with the participant. One way to eliminate that limitation would be to train other individuals that work with the participant throughout the school day. Yet, as the participant was only at school in the mornings, this would be difficult to apply to other settings such as daycare. Another limitation was collecting treatment integrity and interobserver agreement. Once the structure changed to the participant-initiated format, a majority of the sessions were conducted with only the researcher and the participant present. This meant that there was nobody present to conduct treatment integrity or interobserver agreement. One could collect data electronically in order to quickly enlist the assistance of people nearby, without having to sort through pages of paper dependent on the phase and the target. Another way to combat that limitation would be to have an assistant present at all times in the event of a session occurring.

The findings of this study are consistent with the proposition that a functional way to communicate will decrease problem behaviors in an individual. The participant is now more likely to functionally mand for the specific target, rather than using a generalized mand and displaying problem behavior. The results of this study could be used to reason for the importance of the use of mand training to promote functional communication.

Future research may include implementation across settings as well as targets in order to ensure maximum generalization. Using non-food items may foster more consistent motivation as compared to food, which can vary based on multiple intrinsic factors. A potential replication could include targets that are similar to each other based on feature, function, or class, and teach specific discrimination as well as mands.

The study found that the use of a progressive time delay and an echoic-to-mand procedure was successful in both increasing the frequency of independent vocalized mands, but also in increasing the mean length of utterances of the participant. A side effect of the intervention was a decrease in problem behaviors emitted by the participant as well as more specific mands rather than generalized mands. Going forward, these procedures could prove beneficial in mand-training in individuals with autism.

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APPENDIX A: Data Sheet

Echoic-to-Mand Training Michael Tomak - Thesis

Child Name:						Tutor Name:							Date:
Target	**Phase**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Percent**	**Target Notes**

Child Name:						Tutor Name:							Date:
Target	**Delay**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Percent**	**Target Notes**

Child Name:						Tutor Name:							Date:
Target	**Delay**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Percent**	**Target Notes**

APPENDIX B: Procedure Write-Up

Echoic-to-Mand

Objective: To teach the student to independently request for items vocally by transferring the response operant from an echoic response to a mand.

Materials: Echoic-to-mand data sheet and the reinforcers that have been identified as targets for the student.

Procedure:

Phase 1: Run mini-preference assessment to identify first target to teach. Once an item has been selected, initiate the trial by holding the item up close to the child and immediately provide a vocal model of the desired response.

Correct Response: Child echoes the model within five seconds, with an acceptable approximation of the model → Immediately provide the item, no praise should be provided

Incorrect Response: Child does not correctly echo the response or does not make a response within 3-5 seconds of the model → Represent the echoic prompt up to two times and provide the item for a prompted response. Remove item from sight if no correct response occurs to end the trial

Mastery criteria: 1 session at 100% correct OR 5/10 responses are independent

Phase 2: Run mini-preference assessment to identify first target to teach. Before collecting data, hold up the item closer to the child and immediately provide a vocal model of the desired response, do this two times as primer trials. Now begin the session. Initiate the trial by holding the item up close to the child without providing access. If no response occurs after five seconds, provide a vocal model of the response.
Correct Response: Child vocally requests for the item before the first prompt OR echoes the first model within five seconds, with an acceptable approximation of the model → Immediately provide the item, no praise should be provided

Incorrect Response: Child does not correctly echo the response or does not make a response within 3-5 seconds of the model → Represent the echoic prompt up to two times and provide the item for a prompted response. Remove item from sight if no correct response occurs to end the trial

Mastery criteria: 1 session at 100% correct OR 5/10 responses are independent
Demotion Criteria: 2 consecutive sessions at 80% or below

Phase 3: Run mini-preference assessment to identify first target to teach. Before collecting data, hold up the item closer to the child and immediately provide a vocal model of the desired response, do this one time as a primer trial. Now begin the session. Initiate the trial by holding the item up close to the child without providing access.

Correct Response: Child vocally requests for the item with an acceptable approximation before the first prompt is provided → Immediately provide the item, no praise should be provided

Incorrect Response: Child does not correctly echo the response or does not make a response within 3-5 seconds of the item being presented → Present an echoic prompt and provide the item for a prompted response. Represent the echoic prompt up to two more times, every 3-5 seconds. Remove item from sight if no correct response occurs to end the trial.

Mastery criteria: 3 consecutive sessions at 80% correct or higher OR 2 consecutive sessions at 90% correct or higher
Demotion criteria: 2 consecutive sessions at 50% or below

Phase 4: Run mini-preference assessment to identify first target to teach. Initiate the trial by holding the item up close to the child without providing access.

Correct Response: Child vocally requests for the item with an acceptable approximation before the first prompt is provided → Immediately provide the item, no praise should be provided

Incorrect Response: Child does not correctly echo the response or does not make a response within 3-5 seconds of the item being presented → Present an echoic prompt and provide the item for a prompted response. Represent the echoic prompt up to two more times, every 3-5 seconds. Remove item from sight if no correct response occurs to end the trial.

Mastery criteria: 3 consecutive sessions at 80% or higher OR 2 consecutive sessions at 90% or higher
Demotion criteria: 2 consecutive sessions at 50% or below