AN EVALUATION OF NEGATIVELY REINFORCED FUNTIONAL COMMUNICATION TRAINING IN CHILDREN WITH AUTISM SPECTRUM DISORDER ON ACQUISITION OF MANDS AND GENERALIZATION

by
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(Under the Direction of Scott Ardoin)

ABSTRACT

All individuals encounter items, activities, events, or actions that they find aversive or do not prefer. Therefore, it is important to teach those individuals appropriate means of refusal of those aversive stimuli, especially for individuals with developmental disabilities, particularly those with Autism Spectrum Disorder (ASD), who exhibit social communication deficits as part of their diagnosis. The purpose of this study was to investigate if FCT using negative reinforcement could be used to train the mand "No" when presented with a non-preferred activity without conducting a full functional analysis. This study also investigated if trained mands will generalize to untrained non-preferred activities. Using three non-preferred activities, researchers conducted mand training using negative reinforcement across three participants in a kindergarten special education classroom. Results indicated that this procedure was successful for two out of three participants. For both participants, the mand response for refusal generalized to three additional untrained activities.

INDEX WORDS: FCT, negative reinforcement, generalization

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TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

Page

CHAPTER 1

Introduction

All individuals encounter items, activities, events, or actions that they find aversive or do not prefer. It is crucial to teach individuals at a young age the skill set to avoid or refuse these non-preferred objects or actions. Unlike typically developing children, children with developmental disabilities, particularly those with autism spectrum disorder (ASD), exhibit social and communication deficits that can make refusing these non-preferred items more difficult (American Psychiatric Association, 2013). Due to challenges using typical means of communication, these individuals often develop alternative means to avoid aversive activities or items by engaging in challenging behaviors, including aggression, disruption, or elopement (Reeve & Carr, 2000). In an attempt to decrease or eliminate these challenging behaviors, practitioners often design behavioral interventions that reinforce a replacement behavior, which can simultaneously increase compliance with demands (Yi et al., 2006; Groskretuz, 2012). However, if these interventions train children with developmental disabilities to comply with any and all demands or requests, the individuals become vulnerable to particularly dangerous situations (Yi et al., 2006), including physical and sexual abuse (Wilczynski et al., 2015). As part of the diagnostic criteria as written in the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM–5; American Psychiatric Association, 2013), individuals who receive an ASD diagnosis exhibit communication deficits, particularly in social communication. These deficits can take the form of minimal social interaction, limited-to-no initiation for social interaction, and/or a limited ability to recognize and use nonverbal communication, making them susceptible to increased abuse from caregivers, practitioners, family members, and the general public

(Wilczynski et al., 2015). As many as 68% of females and 30% of males under the age of 18 with developmental disabilities report cases of sexual abuse. Considering the rates of abuse are higher among individuals with developmental disabilities than within other populations, providing them with the skills to refuse non-preferred items, activities, and actions has the potential to offer greater independence for them and their families (Wilczynski et al., 2015).

A number of studies have investigated the effect that self-determination has on the lives of individuals with developmental and intellectual disabilities in the past three decades (Wehmeyer et al., 1996). As defined by Wehmeyer et al. (1996), self-determined behaviors include an individual making their own choices in regard to their preferences to ensure a high quality of life without any outside influences. Self-determined behaviors are behaviors that are achieved through an individual communicating a need for autonomy and engaging in self-advocacy (Shogren et al., 2017). Research on self-determination indicates that individuals who engage in self-determined behaviors are more likely to experience a higher quality of life (Wehmeyer & Palmer, 2003; Wehmeyer & Schwartz, 1997).

Individuals with developmental disabilities often develop challenging behaviors when presented with aversive stimuli and these behaviors are usually negatively reinforced by their environment (Iwata, 1987). For example, a client in a school typically engages in aggression in the form of hitting when presented with a puzzle. When this client hits his teacher upon the presentation of the puzzle, the teacher removes the puzzle and tells him they do not have to complete it. If this aggressive behavior continues or increases every time the puzzle is presented and then removed contingent on aggression, the teacher is negatively reinforcing this behavior. Hineline (1977) categorized negatively reinforced behavior as those that can happen in the presence of an aversive stimulus and when a response to terminate that stimulus, such as

engaging in challenging behavior, results in the removal of the stimulus. Negatively reinforced behaviors are also operantly conditioned by either an avoidance contingency that prevents the presentation of the aversive stimulus or an escape contingency that stops an aversive stimulus from continuing (Hineline & Rachlin, 1969). The current study investigates escape contingencies when participants engage with non-preferred activities. The treatment of negatively reinforced challenging behaviors can include implementing a combination of extinction of the challenging behavior by not reinforcing that behavior and differential reinforcement by reinforcing an alternative response instead of reinforcing the challenging behavior (Iwata, 1987).

In an effort to teach an appropriate response of refusal, a primary component of instruction for individuals with developmental disabilities is to teach communication, mainly to convey wants and needs. One way that practitioners can achieve this is to teach children to mand. An individual engages in manding, which is an essential behavioral cusp in a child's development, to communicate a specific want or need when a motivating operation is present (Sundberg & Michael, 2001). Teaching a child to mand can present them with many opportunities for social communication with those around them to achieve more control over their environment. The majority of recent research on teaching individuals with communication deficits to mand focuses on functional communication training (FCT; Chezan et al., 2018; Carr & Durand, 1985).

Functional Communication Training (FCT)

FCT is a recognized and evidence-based intervention to teach individuals with developmental disabilities communication based on the function of behavior. For example, if a practitioner were to teach an individual more appropriate communication to avoid or escape non-preferred activities, they would proceed intervention by conducting a functional assessment by

manipulating the individual's environment. In the case of avoiding aversive items or events, conducting a functional assessment can help confirm that the behavior they want to change has an escape function to guide an FCT intervention. After a practitioner identifies a function, they identify an alternative response known as a functional communicative response that is functionally equivalent to the challenging behavior they want to change. Then, they implement a differential reinforcement procedure, which involves providing the participant with reinforcement contingent on the occurrence of the functional communicative response and ideally, not providing reinforcement to the challenging behavior through extinction. This procedure continues until the participant allocates their responding to the alternative response, the functional communicative response, instead of the challenging behavior (Carr & Durrand, 1985; Chezan et al., 2018).

Much of the applied research on FCT focuses on teaching an individual to ask for tangible items or attention using "I want" statements or to escape task demands by requesting a break (Cooper et al., 2019). There is a relatively smaller number of studies that teach manding for the escape of non-preferred items or activities by using a mand for refusal (e.g. "No," "Done," or "Finished") instead of using a mand to request a break from an activity (Lalli et al., 1995; Waker et al., 2013). By using a mand to request a break from an aversive stimulus, the individual is likely to encounter that stimulus again when their break has elapsed. However, by refusing an aversive stimulus by using a mand such as "No," the individual is likely to not encounter that stimulus in the future, which is the focus of the current study.

When training for the alternative response to refuse an aversive stimulus in the treatment of negatively reinforced behaviors, the FCT literature often employs negative reinforcement as a common strategy. Studies such as Carr and Durrand (1985), Fisher et al. (2005) and Zangrillo et

al. (2016) use negative reinforcement to teach manding for the escape from non-preferred stimuli in a variety of topographies (e.g., “Break,” “Done,” “Finished,” etc.). Current FCT literature involving the uses of negative reinforcement typically investigates added or nuanced components of these interventions further than just negatively reinforced alternative responding. Examples of these topics include resurgence of challenging behavior and response strength (Wacker et al., 2013; Berg et al., 2015), schedule thinning (Fisher et al., 2000; Zangrillo et al., 2016), and generalization of trained mands (Falcomata et al., 2013).

Like all behavioral interventions, there can be challenges associated with the implementation of FCT. Typically, FCT interventions are guided by functional assessment data, which oftentimes involves the conducting of a functional analysis. A full functional analysis, as originally explained by Iwata et al. (1994), has some practical limitations (Iwata & Dozier, 2008). Functional analyses are time-consuming assessments that involve experimental manipulations of the environment and are most effective when conducted in the context of one challenging behavior at a given time (Beavers et al., 2013). Therefore, if an individual engages in multiple challenging behaviors, such as aggression and elopement, that all require interventions, each behavior might require a separate functional analysis (Beavers et al., 2013). Furthermore, some behaviors and replacement behaviors might not be adequately captured within the contrived conditions of functional analysis, which can ignore meaningful variables to incorporate into intervention (Holden, 2002). Due to the challenges associated with conducting a functional analysis, some research discusses alternative functional assessments to determine a function between challenging behavior and the environment (Iwata & Dozier, 2008). These assessments can include conducting indirect assessments using caregiver interviews in combination with direct observations (Chezan et al., 2016) or arranging baseline to depict a maintaining function

(Chezan et al., 2018; Groskretuz et al., 2014). The current study uses these alternative strategies for determining a maintaining function and to verify that the non-preferred stimuli selected for training produced an aversive effect.

Generalization

As Baer et al. (1968) initially emphasized, generalization is crucial to any behavioral intervention. Systematically programming for the generalization of the behavior to occur outside intervention contexts increases the likelihood that it will generalize, therefore strengthening the behavioral programming of intervention (Baer et al., 1968). Recent research has extensively explored the technology of programming for generalization since Stokes and Baer (1977) outlined nine strategies to program for generalization (Osnes & Lieblein, 2002). The current study will draw from the generalization strategies outlined in Stokes and Bear (1977) and further explored in Stokes and Osnes (1989) to investigate the generalization of negatively reinforced mands to untrained stimuli (Falcomata & Wacker, 2013). This study will use the generalization-promotion training strategy for multiple examples by conducting mand training in the context of more than one non-preferred stimuli (Stokes and Baer, 1977).

Research Questions

The primary research question for this study is: Can negative reinforcement be used during functional communication training to teach children with an eligibility of ASD appropriate means to refuse non-preferred activities as a replacement for challenging behavior in the absence of a full functional analysis as originally outlined by Iwata et al. (1994)? The secondary research question for this study is: Can mands taught using negative reinforcement generalize to untrained non-preferred activities?

CHAPTER 2

Method

Participants and Setting

Three students in a self-contained kindergarten special education classroom were participants in this study. The classroom was a university-based lab applied behavior analysis (ABA) class run by master's students and doctoral candidates who had or were pursuing their board-certified behavior analyst (BCBA) certification. Researchers who participated in data collection were pursuing their master's or doctoral degrees in special education or applied behavior analysis. Inclusion criteria for participation in this study was that all participants had an eligibility for special education of ASD, a range of aggressive and disruptive behaviors when presented with non-preferred activities and limited to no vocal repertoire. All participants also received one-on-one discrete trial training instruction during the school day.

Samantha was a female, 5-year-old African American student with a limited vocal repertoire composed of one-word approximations of words. She used picture exchange as her primary form of communication and could make three to four-word sentences using pictures to express needs and wants using "I want" statements. During the Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP; Sundberg, 2008), she received a score of 25.5. She also scored a 54 on the General Conceptual Ability portion of the Developmental Profile 3 (DP-3; Alperm, 2007) assessment. All scores suggest that she falls below levels of her same-age peers in areas such as verbal skills, development, and adapted behavior. Jamie was a male, 6-year-old African American student with a limited vocal repertoire composed of one to four-word phrases. He was emerging in the use of an augmentative and alternative communication (AAC)

device. According to parent reports, Jamie received DP-3 scores of 52 in the cognitive area, 52 in the communication area, 57 in the adapted behavior area, and less than 50 in the social area. All scores suggest that Jamie falls within the delayed range for all of these areas. Ethan was a male, 5-year-old Caucasian student with a limited vocal repertoire composed of one to two-word approximations of words. He was emerging in the use of an AAC device and also used picture exchange as his primary form of communication. Ethan received a score of 31.0 during the Verbal Behavior Milestones Assessment and Placement Program. He also received scores of less than 50 in the cognitive area and 52 in the adapted behavior area of the DP-3. All scores suggest that he falls in the delayed range compared to the same-aged peers' scores.

Materials

Data collectors used a Countee template for data collection on a smartphone with access to the Countee app. This template records the duration of each session and instances of both problem behavior and mands by touching a key following each occurrence of the corresponding behavior. A partial interval recording datasheet and an interval timer app on a smartphone were also used to measure the occurrences of challenging behavior. To identify the non-preferred activities for each participant, the NRRS, created by Zarcone et al. (1999), was used. The NRRS was administered and completed by the teacher using pencil and paper. The NRRS consists of a list of different daily living or academic activities or tasks that could be aversive to an individual. Respondents used a Likert scale rating from 1 (does not bother the student) to 4 (always bothers the student) to rate the participant's typical reaction to each activity.

This study incorporated a "No" card as a target mand response for all participants in addition to target mand vocalizations. The "No" card was printed on a green 8 cm by 12 cm

index card and was present on the table during FCT, generalization, and maintenance probe sessions.

Experimental Design

This study utilized a multiple probe across participants design to evaluate FCT that employed negative reinforcement. The NRRS completed by participants' teachers and direct observations of each participant identified three activities as non-preferred or aversive to the participant before the commencement of the baseline condition. These three activities were used during baseline, FCT, and maintenance sessions. Data collection included measurements of instances of any problem behavior, independent and prompted manding, and latency from the presentation of a stimulus to occurrences of problem behavior or an independent mand response across all sessions for all participants.

Dependent Variables

The dependent variables for this study were: (a) the percentage of occurrences of the target mands, (b) the percentage of occurrences of challenging behavior within each session using PIR at a 10s interval, and (c) latency to challenging behavior from when the researcher presented the non-preferred activity to the participant to the first instance of challenging behavior. Data collectors used a coding system across all conditions to record the occurrences of target mand responses, challenging behavior, and latency to challenging behavior. All sessions were video-recorded, and primary and interobserver agreement data collection utilized the video recording to complete data collection. The target mand was defined as the participant verbally saying "No," or "I don't want that," touching the "No" button on an AAC device or using the "No" card. Problem behavior was defined for all participants as follows: (a) Disruption: any instance where an object that was in one or both hands was moved three or more inches away

from its original position, any instance or attempt where the participant altered materials by ripping or crumpling the materials when not instructed to do so, or any instance where the participant's open or closed hand came into contact with the table or chair that resulted in an audible sound. (b) Aggression: is any instance or attempt where the participant's open or closed hand or foot came into contact with any part of another person, the participant displaced another person from their original position with their body or by pushing the other person with an open or closed hand, the participant's mouth opened and closed around any part of another person's body, the participant's hand became entangled in another person's hair resulting in the other person's head moving from its original position, or the participant's saliva left their mouth and made contact with another person. (c) Drop flop: any instance where the participant went from sitting to lying down or standing to sitting when not instructed to do so. (d) Elope: any instance where the participant moved more than an arm's reach away from a designated area without being instructed to do so. (e) Off task: any instance where the participant's body or eyes were not oriented to the table, materials, or primary investigator with an onset/offset time of 3 s or any instance where the participant laid their head onto the table without being instructed to do so with an onset/offset time of 3 s. (f) Screaming or yelling: any instance where the participant emitted a sound louder than conversation volume for any period of time. (g) Crying: any instance where the participant vocalized using sounds or words while frowning with or without the presence of tears for any period of time.

Procedure

Conditions in this experiment included baseline, FCT, generalization probes, and maintenance probes. After administering the NRRS and identifying three non-preferred activities for each participant, researchers conducted baseline measurements to ensure that the appropriate

mand response was not already in the participant's repertoire and establish that challenging behavior occurred when the individual engaged with the non-preferred activity. After baseline data remained stable for a minimum of three data points, FCT commenced with one participant. While the first participant was in the FCT condition, baseline measurements continued for the other participants every 3 to 4 sessions on average. When the first participant reached mastery criteria during FCT of all three activities, FCT commenced with the second participant. Then when the second participant reached mastery criteria, the third participant started FCT sessions. All sessions consisted of three presentations of each activity in a randomly selected order. Occurrences of problem behavior and appropriate mands were measured using partial interval recording across all sessions at a 10 s interval. There was at least 5 min break between each data collection session, and each data collection was not conducted for more than three sessions each day.

Preference Assessment

For all participants, this study employed a modified version of the NRRS (Zarcone et al., 1999) to identify non-preferred activities using a Likert scale from 1 (does not bother the student) to 4 (always bothers the student). After observation of the participants in their naturalistic environments, each participant's teacher completed the NRRS to identify potential activities that could be non-preferred or aversive. The NRRS was written in a questionnaire format and provided the teacher with a series of categories of class activities that each participant might want to avoid (e.g., completing self-care tasks or completing tasks with multiple steps). This list included some of the same activities used in Zarcone et al. (1999) and other activities that were unique to these participants. The NRRS prompted the teachers to rate each category of activities using the Likert scale and provide specific examples of activities they observed to be

aversive within each category. Their teachers were also interviewed to verify that our observations were representative of each participant.

Baseline

Baseline sessions started with the presentation of the controlling stimulus "It's time to do _(activity)_" and were composed of three trials and one presentation of each activity. A trial included presenting one of the predetermined non-preferred activities. All three trials occurred in a randomized order across baseline sessions. The non-preferred activity was presented for 1 min after the primary investigator delivered the controlling stimulus. If at any point during the trial the participant engaged in challenging behavior, the researcher ignored the challenging behavior and redirected the participant to the activity. The participant was allowed to engage with the activity at any point during the 1 min trial. In combination with the results of the NRRS, baseline sessions served to verify a negatively reinforced escape function that maintained challenging behavior.

FCT

This study conducted a pre-exposure session each day before the commencement of FCT sessions to teach the target mand to the participant. Pre-exposure trials involved using a model prompt (e.g., "You can say 'No' or 'I don't want that," or modeling touching "No" on their AAC device or using the “No” card) immediately after the delivery of the controlling stimulus, "It's time to do _(activity)" and the presentation of the non-preferred activity. During these sessions, the participant would receive a 1 min intertrial break after engaging in the appropriate mand following the model prompt before the subsequent trial would begin. The "No" card was present for these sessions, and the model prompt was repeated until the participant engaged in the target mand for the removal of the non-preferred activity.

FCT sessions started with presenting the controlling stimulus "It's time to do _(activity)_." Sessions included the presentation of all three non-preferred activities presented in a randomized order, for a total of three trials in a session. Each FCT session used a least-to-most prompting method to teach the appropriate mand response. Contingent on one occurrence of challenging behavior as previously defined, the principal investigator provided the participant with a prompt level 1 and a prompt level 2 upon another occurrence of challenging behavior. The prompt levels were as follows:

- Prompt Level 1- model the appropriate mand (e.g., "You can say 'No' or 'I don't want that," or modeling touching "No" on their AAC device or using the “No” card)
- Prompt Level 2- physically prompt the participant to hand the observer a "No" card or touch the appropriate response on their AAC device.

If the participant independently engaged in the target mand response during the trial, the experimenter said, "Okay, you don't have to," removed the activity, and provided the participant with a 3 min intertrial break. If the participant received a prompt using a level 1 or 2 prompt, the experimenter said, "Okay, you don't have to," removed the activity, and provided the participant with a 1 min intertrial break. The "No" card was present at all times during all FCT sessions, regardless of whether the participant engaged with it. A participant reached mastery criteria for the training of all three activities when they independently engaged in the target-mand response for the removal of the activity for three out of three trials, with no occurrences of problem behavior during the session across three consecutive sessions of data collection.

For participant 1, Samantha, two additional conditions were conducted based on responding during the FCT condition: (a) FCT with increased pre-exposure and (b) FCT using positive and negative reinforcement. To increase the teaching of the independent mand response,

researchers conducted the FCT with the increased pre-exposure condition by including a pre-exposure session before each data collection session instead of conducting one session at the beginning of each day of data collection. After the FCT with increased pre-exposure sessions was shown to be ineffective in training the mand response, researchers commenced the FCT using positive and negative reinforcement conditions. This condition added positive reinforcement in the form of edible items to the negative reinforcement of removing the non-preferred activity. This condition was included to mimic the picture exchange communication system (PECS; Frost & Bondy, 2002) protocol.

Generalization and Maintenance

Generalization probes were conducted once the participant reached mastery criteria. Generalization probes used three additional untrained non-preferred activities, and each trial included three presentations of the activity. At the beginning of each trial, the controlling stimulus "It's time to do _(activity)_" was presented before the presentation of the untrained non-preferred activity. Data collection included the recording of any occurrence of manding and challenging behavior using a Countee template and the PIR datasheet and the latency from the presentation of the non-preferred activity to challenging behavior or an independent target mand response. The untrained non-preferred activities were presented in randomized order throughout the probe session and followed the same protocol as baseline sessions. If the participant engaged in the independent target mand response at any point during the trial, the principal investigator removed the activity, said, “Okay, you don’t have to,” and provided the participant with a 3 min inter-trial break.

Maintenance probes were also conducted to measure if FCT persisted over time for the three trained non-preferred activities. Maintenance probes started one week after the conclusion

of training all three activities, and each session included three presentations of all three items in a randomized order. Mands and challenging behavior were recorded using a Countee template and the PIR datasheet, as well as latency from the presentation of the non-preferred activity to challenging behavior or an independent target mand response. Maintenance probes followed the same protocol as FCT sessions.

Social Validity

Staff members employed in the participant's classroom who did not participate in data collection completed a social validity questionnaire after all data collection sessions. This questionnaire asked a series of questions using a Likert scale rating: 1- strongly disagree, 2-disagree, 3-neutral, 4- agree, 5-strongly agree. Questions included how the participant gained or did not gain anything from this study, if the participant used the mand response outside of this study in the classroom to refuse non-preferred items or activities, or if the participant's engagement in challenging behavior increased or decreased after this study.

Interobserver Agreement

Interobserver agreement was measured across all conditions and all participants for average latency and partial interval recording measurements. Interobserver agreement was calculated for the average latency from the presentation of the non-preferred to the first instance of challenging behavior or an independent target mand response using a gross agreement equation. This formula was the smaller latency measurement divided by the larger latency measurement and multiplied by 100. For partial interval recording of percent of intervals with challenging behavior, the formula used a point-by-point agreement by dividing the number of agreements by the number of agreements plus the number of disagreements and multiplying by 100.

Baseline session interobserver agreement for Samantha was calculated for 40% of sessions. The latency average was 96.51%, with a range of 93.02% to 100%, and the percent of intervals with challenging behavior average was 92.04%, with a range of 89.47% to 95%. Baseline session interobserver agreement for Jamie was calculated for 27% of sessions. The latency average was 95.75%, with a range of 88.67% to 100%, and the percent of intervals with challenging behavior average was 97.37%, with a range of 94.74% to 100%. Baseline session interobserver agreement for Ethan was calculated for 25% of sessions. The latency average was 95.78%, with a range of 85.44% to 100%, and the percent of intervals with challenging behavior average was 94.94%, with a range of 89.47% to 100%.

Interobserver agreement was calculated for 26% of FC sessions for Samantha. The latency average was 98.42%, with a range of 94.33% to 100%, and the percent of intervals with challenging behavior average was 98%, with a range of 80% to 100%. Interobserver agreement was calculated for 29% of FCTT sessions for Jamie. The latency average was 98.25%, with a range of 95.34% to 100%, and the percent of intervals with challenging behavior average was 100%. Interobserver agreement was calculated for 26% of FCT sessions for Ethan. The latency average was 95.69%, with a range of 91.38% to 100%, and the percent of intervals with challenging behavior average was 100%.

Interobserver agreement was calculated for 33% of generalization probes for Jamie and Ethan. The latency average was 96.46%, with a range of 92.93% and 100%, and the percent of intervals with challenging behavior average was 100%. Interobserver agreement was also calculated for 33% (1 out of 3) of maintenance probes for Jamie and Ethan. The latency measurement was 95.17% agreement, and the percent of intervals with challenging behavior was 100% agreement.

Procedural Fidelity

Procedural fidelity was collected across all conditions for all participants. During baseline measurements, procedural fidelity was collected for 40% of sessions for Samantha, 27% of sessions for Jamie, and 25% of sessions for Ethan. Procedural fidelity was 100% across all recorded baseline sessions. During FCT, procedural fidelity was collected for 26% of sessions for Samantha, 29% of sessions for Jamie, and 26% of sessions for Ethan. Procedural fidelity was also 100% across all recorded FCT conditions. Procedural fidelity was also recorded at 100% for 33% of generalization and maintenance probes for Jamie and Ethan.

CHAPTER 3

Results

Samantha

Based on results of the NRRS that Samantha's teacher completed before baseline researchers identified three non-preferred activities to use during FCT sessions. The non-preferred activities used during FCT included: calendar instruction using the smartboard, money instruction using the smartboard, and Wh question (e.g., who, what, when, and where) instruction using the smartboard.

Figure 1 displays the average latency in seconds to (a) challenging behavior and (b) an independent mand response from the presentation of the controlling stimulus and the non-preferred activity. Each session included three trials, and the latency measures indicate the average of all three trials within each session. The top panel of the graph represents the results for Samantha. For Samantha, baseline occurred for five sessions. Substantial variability (range: 5 s to 35.3 s) was observed in Samantha's latency to inappropriate behavior during baseline and an overall decreasing trend (M = 12 s) in average latency from the presentation of the non-preferred activity to challenging behavior. The top panel of Figure 2 displays the percent of intervals with challenging behavior on the primary axis and the number of independent mands (0-3) on the secondary axis for Samantha. Table 1 also presents the average and range of the percent of intervals with challenging behavior. The figure represents an overall increasing trend in the percentage of intervals with challenging behavior during baseline and a moderate level of variability between the data points. Samantha also engaged in zero independent target mand responses during the baseline condition.

With the introduction of FCT, there was an immediate increase in the level of latency from the presentation of the non-preferred activity to challenging behavior with an overall decreasing trend across the condition. There was also a reasonable amount of variability in her average latency to problem behavior (range: 9 s to 31s). In general, there was little change in the level *(M* = 14.43) when compared to that of baseline. The percentage of nonoverlapping data points (PND; Scruggs & Mastropieri, 1998) for the average latency to problem behavior was 0% from baseline to FCT. As represented in figure 2, there was a substantial immediate decrease in the level of percent of intervals with problem behavior during the FCT condition. Within FCT, there was also a slightly increasing trend, increased variability within the condition, and very little change in the level when compared to that of baseline. Overall, Samantha engaged in zero independent target mand responses during the FCT condition.

Due to failure of Samantha to meet mastery criterion following 15 sessions of FCT, a decision was made to enhance instruction. To increase teaching opportunities, the FCT with increased pre-exposure condition began at session 21. This condition included a pre-exposure session before every data collection session instead of one session at the beginning of every data collection day. There was no immediate change in the latency from the presentation of the non-preferred activity to challenging behavior and little change in both the level (*M* = 10.41 s) and variability (range: 5 s to 18.66 s) from the FCT condition. The PND for the average latency to problem behavior was 8.33% from the FCT condition to the FCT with increased pre-exposure condition. There was also no observed trend in average latency from the presentation of the non-preferred activity to challenging behavior or an independent mand response. Figure 2 presented a substantial immediate decrease in the level of the percentage of intervals with challenging behavior and a slightly increasing trend. When compared to the previous FCT condition, there is

little change in variability in the percent of intervals with challenging behavior. Samantha engaged in one independent mand response in sessions 23, 24, and 30, and two independent mand responses in session 21 during the FCT with increased pre-exposure condition.

The FCT with positive and negative reinforcement started at session 33, where positive reinforcement was presented as a consequence to the target mand in addition to negative reinforcement. Overall, there was a slight reduction in level (M = 8.11 s) and variability (range: 4 s to 18.66 s) from the FCT with increased pre-exposure condition. The PND for the average latency to problem behavior was 0% from FCT with increased pre-exposure to FCT with positive and negative reinforcement. There was also no observed trend in average latency from the presentation of the non-preferred activity to challenging behavior or an independent mand response. For the percent of intervals with challenging behavior, figure 2 shows a small immediate change in the level and an overall moderate amount of variability. Like latency, there was no observed trend for percent of intervals with challenging behavior during the FCT with positive and negative reinforcement condition. Additionally, Samantha engaged in one independent mand response in session 41 during the FCT using positive and negative reinforcement condition.

Figure 3 presents a cumulative record of Samantha's independent mand responses during all FCT sessions (session 6 through session 58). Samantha engaged in a total of 6 independent mand responses during all FCT conditions.

Samantha never reached mastery criteria during any FCT conditions, so FCT commenced with Jamie starting at session 35. For Samantha, this intervention was not effective in training a mand for the refusal of non-preferred activities.

Jamie

Based on results of the NRRS that Jamie's teacher completed before baseline researchers identified three non-preferred activities to use during FCT and three non-preferred activities to use during generalization probes. The non-preferred activities used during FCT included: identifying letter sounds, identifying the colors of common objects, and using the dollar plus method to pay for items. For the generalization probes, the activities used included putting on a shirt, a calendar lesson using the smartboard, and typing words (name, animals, etc.).

The middle panel of Figure 1 represents the results for Jamie. For Jamie, the baseline condition took place from session 1 to session 34 for a total of 15 baseline sessions. During baseline, the average latency from the presentation of the non-preferred activity to challenging behavior began with a high amount of variability (range: 2.66 s to 36.33 s) but decreased throughout the condition, which produced a decreasing trend (M =12.32 s). The middle panel of Figure 2 displays the percent of intervals with challenging behavior on the primary axis and the number of independent mands (0-3) on the secondary axis for Jamie. Table 2 also presents the average and range of the percent of intervals with challenging behavior. The results of the percent of intervals with challenging behavior depict a slightly increasing trend and a moderate amount of variability between data points. Additionally, Jamie engaged in zero independent target mand responses during the baseline condition.

With the commencement of FCT sessions starting at session 35, there was a moderate immediate change in level from baseline to the FCT condition. Additionally, there was a slightly increasing trend (M =15.43 s) with a large amount of variability (range: 3 s to 22.6) within the average latency from the presentation of the non-preferred activity to challenging behavior, which produced an increase in level when compared to that of baseline. The PND for the average

latency to problem behavior was 0% from baseline to FCT. Furthermore, there was a small amount of variability (range: 2 s to 8.33) in the average latency from the presentation of the non-preferred activity to an independent mand response at a similar level to that of baseline (M = 4.71 s). There was no observed trend in the average latency from the presentation of the non-preferred activity to an independent mand response. When comparing the last five data points of baseline and FCT, the latency from the presentation of the non-preferred activity to the first instance of challenging behavior decreased from an average of 4.26 s during baseline to only one instance of challenging behavior with a latency measurement of 15 s. For the percent of intervals with challenging behavior, figure 2 showed no immediate change in the percent of intervals with challenging behavior. However, there was an overall decreasing trend to a level of 0% of intervals with challenging behavior. There was also a reasonable amount of variability between the data points in the FCT condition, which produced a moderate decrease in the level when compared to that of baseline. Jamie also engaged in one independent mand response during sessions 42, 43, and 51, two independent mand responses during sessions 40, 41, 45, and 53, and three independent mand responses during sessions 44, 46, 47, and 48. Jamie met mastery criteria during session 48 when he engaged in the target mand response independently for three out of three trials and engaged in zero intervals of challenging behavior across three sessions of data collection. During FCT for Jamie, Ethan's baseline data remained stable suggesting that it was intervention that resulted in observed changes.

Figure 4 represents Jamie's cumulative record of independent mand responses during all FCT sessions (session 35 through session 48). Jamie engaged in a total of 20 independent mand responses during FCT sessions at a stable rate from session 39 to session 48.

Generalization

The middle panel of figures 1 and 2 displays the generalization probes conducted with Jamie after he achieved mastery criteria during the FCT condition. For the six sessions conducted, he independently engaged in the target mand response once during session 51, twice during session 53, and three times during sessions 54, 55, and 56. During generalization probes, the latency from the presentation of the non-preferred activity to the first instance of challenging behavior ranged from 17 s to 30.5 s (M = 25.05 s), and the latency to independent mand response ranged from 2 s to 4.33 s (M = 3.78 s). He also engaged in challenging behavior for a range of 48% to 0% (M = 16%).

Maintenance

The middle panel of figures 1 and 2 also displays the three maintenance probes conducted with Jamie at 7, 8, and 9 days respectively, after achieving mastery criteria during the FCT condition. He engaged in the independent mand response for all 3 trials in all 3 maintenance probe sessions. The latency from the presentation of the non-preferred activity to the independent mand response remained at low levels *(*M = 5.66) with very little variability (range: 5.33 s to 6 s). He also engaged in challenging behavior for 0% of all sessions.

Ethan

Based on the results of the NRRS that Ethan's teacher completed before baseline, researchers identified three non-preferred activities to use during FCT. The non-preferred activities used during FCT included: completing a number puzzle, completing an alphabet puzzle, and counting and sorting leaves.

The bottom panel of Figure 1 represents the results for Ethan. For Ethan, the baseline condition took place from session 1 to session 49, for a total of 20 data collection sessions. For

the average latency from the presentation of the non-preferred activity to challenging behavior, Figure 1 demonstrated substantial variability (range: 2.33 to 32.6 s) across sessions 1-42. There was a moderate, decreasing trend (M =12.31 s) in average latency from the presentation of the non-preferred activity to challenging behavior. The bottom panel of Figure 2 displays the percent of intervals with challenging behavior on the primary axis and the number of independent mands (0-3) on the secondary axis for Ethan. Table 3 also presents the average and range of the percent of intervals with challenging behavior. There was a moderate amount of variability between data points for the percent of intervals with challenging behavior during the baseline condition and a slightly increasing trend toward the end of baseline. Additionally, there was a reasonable amount of variability between data points. Ethan also engaged in zero independent target mand responses during the baseline condition as shown in Figure 2.

FCT commenced with session 51 following stability in Ethan's data and Jamie meeting of mastery criteria. From baseline to FCT, there was a small immediate increase in the latency from the presentation of the non-preferred activity to challenging behavior and a slightly decreasing trend *(*M = 9.91 s). There was also a moderate decrease in variability (range: 3 s to 28) than that of baseline. The PND for average latency to problem behavior was 0% from baseline to FCT. Additionally, there was a moderate amount of variability (range: 1.66 s to 20) in the average latency from the presentation of the non-preferred activity to an independent mand response at an overall decreased level (M = 6.73 s) to that of baseline. There was no observed trend in the average latency from the presentation of the non-preferred activity to an independent mand response. When comparing the last five data points of baseline to FCT, the latency from the presentation of the non-preferred activity to the first instance of challenging behavior decreased from an average of 3.73 s during baseline to only 2 instances of challenging behavior

with a latency measurement of 8 s and 28 s during FCT. As shown in figure 2, there was no immediate change in the level of the percent of intervals with challenging behavior, but there was a decrease in overall level due to the decreasing trend as FCT continued. There was also a slightly decreased amount of variability compared to that of baseline. These factors produced an overall decreased level from the baseline condition. Figure 2 also demonstrates that Ethan engaged in one independent mand response during sessions 56 and 58, two independent mand responses during sessions 55, 59, 61, and 62, and three independent mand responses during sessions 60, 63, 64, and 65. Ethan met mastery criteria during session 65 when he engaged in the target mand response independently for three out of three trials and engaged in zero intervals of challenging behavior across three sessions of data collection.

Figure 5 represents Ethan's cumulative record of independent mand responses for participant 3, Ethan, during all FCT sessions (session 51 through session 65). Ethan engaged in a total of 22 independent mand responses at a stable rate from session 54 to session 56 and from session 57 to session 65.

Generalization

The bottom panel of figures 1 and 2 displays the generalization probes conducted with Ethan after he achieved mastery criteria during the FCT condition. For the six sessions conducted, he independently engaged in the target mand response three times during sessions 66, 67, and 68. During generalization probes, the latency to independent mand response ranged from 1 s to 2.66 s (M = 1.66 s). He also engaged in challenging behavior for 0% of all intervals.

Maintenance

The bottom panel of figures 1 and 2 also displays the three maintenance probes conducted with Ethan at 12, 13, and 14 days respectively, after achieving mastery criteria during

the FCT condition. He engaged in the independent mand response for all 3 trials in all 3 maintenance probe sessions. The latency from the presentation of the non-preferred activity to the independent mand response remained at low levels *(M* = 2.11 s) with very little variability (range: 1 s to 3 s). He also engaged in challenging behavior for 0% of all sessions.

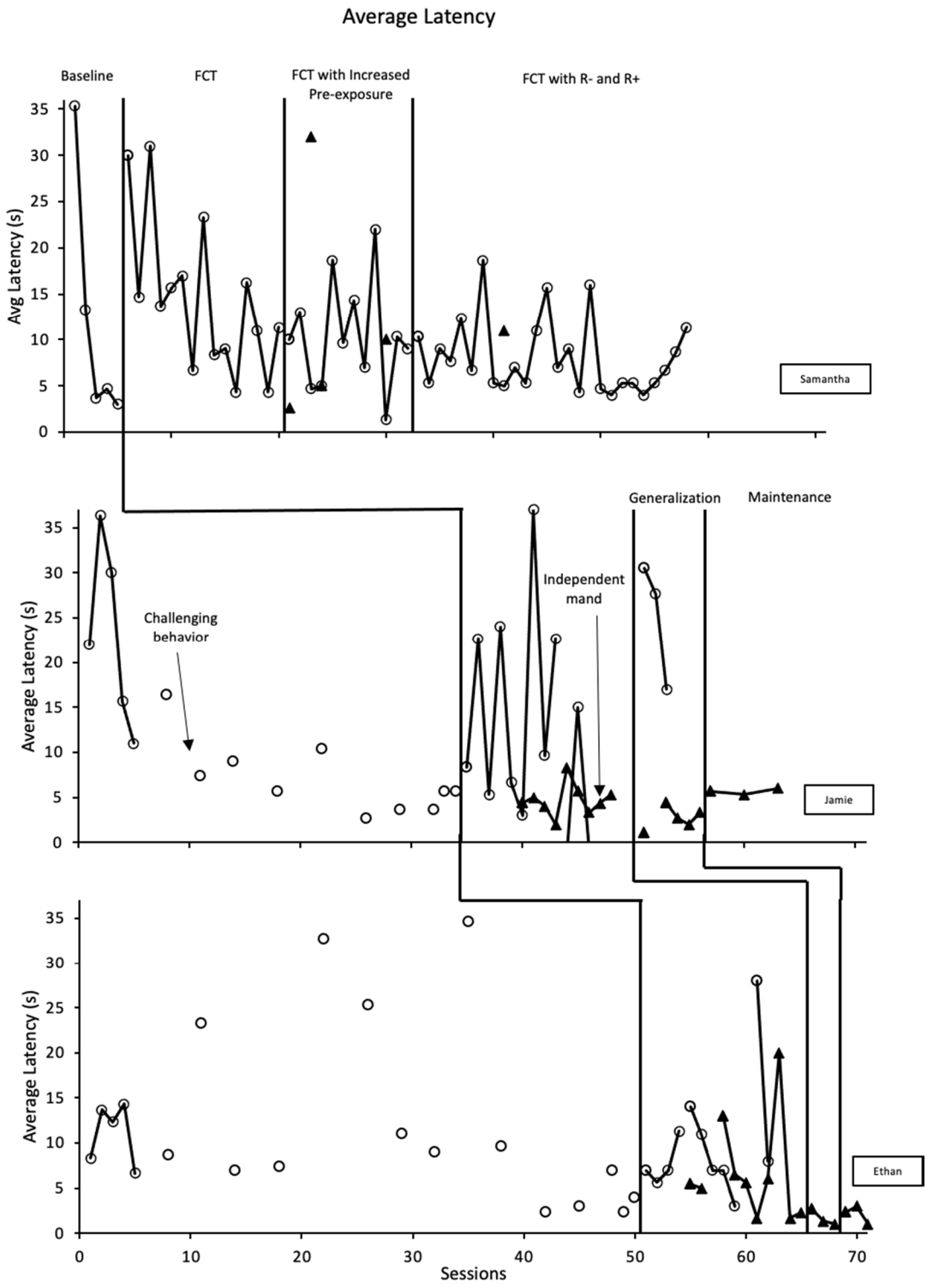

Figure 1. Average latency in seconds from the presentation of the non-preferred activity to challenging behavior (open circles) or an independent mand response (closed triangles) for all three participants.

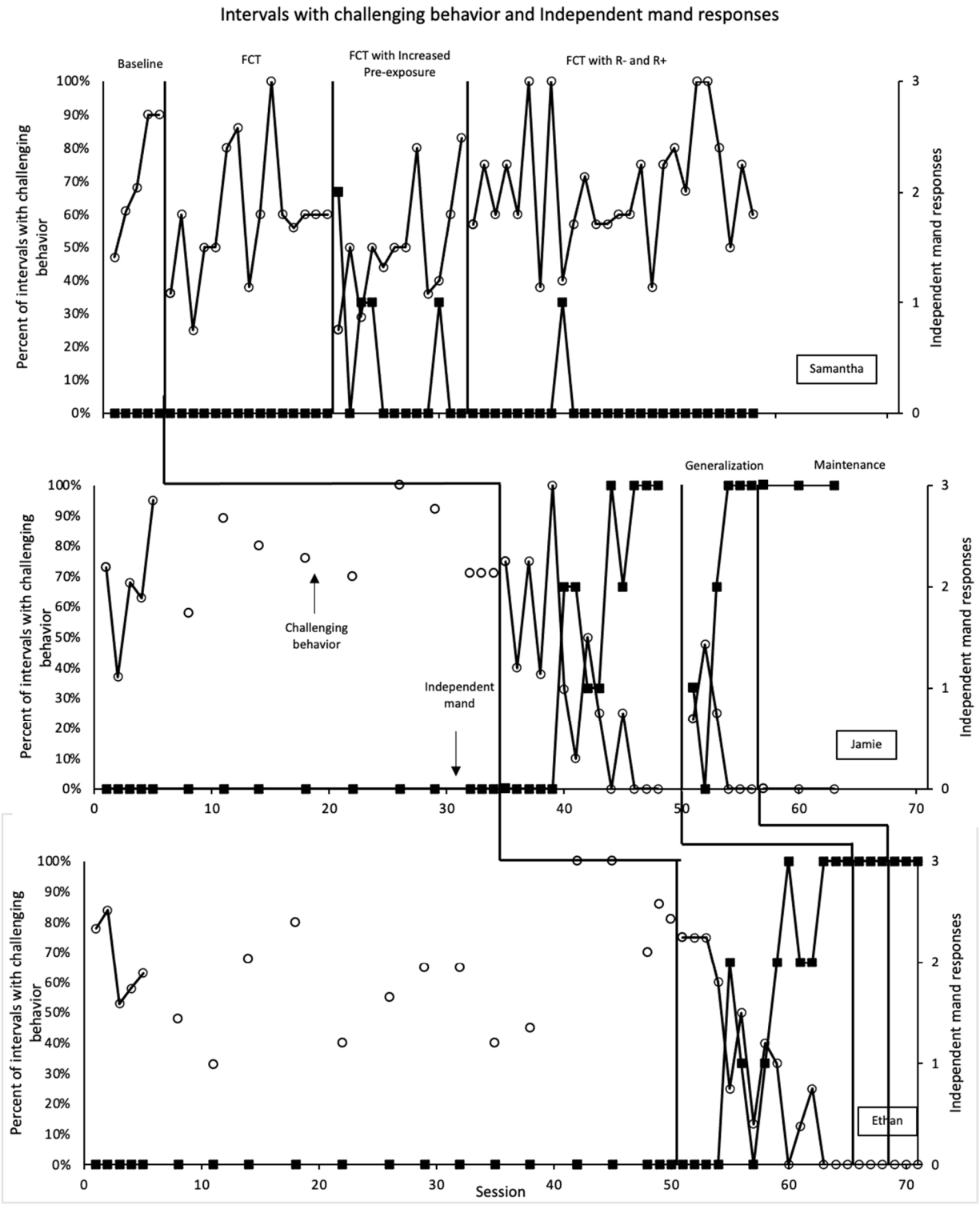

Figure 2. Intervals of challenging behavior (primary axis) are represented using open circles, and independent mand responses (secondary axis) are represented using closed squares for all three participants.

	Average Percentage of Intervals	Range of Percentage of Intervals
Baseline	*M*=71%	47% - 90%
FCT	*M*=59%	25% - 100%
FCT with Increased Pre-exposure	*M*=50%	25% - 83%
FCT with Positive and Negative Reinforcement	*M*=68%	40% - 100%

Table 1. Average and range of percentage of intervals with challenging behavior (using partial interval recording at a 10 s interval) for Samantha

	Average Percentage of Intervals	Range of Percentage of Intervals
Baseline	*M* = 74%	37% - 100%
FCT	*M* = 34%	0% - 100%

Table 2. Average and range of percentage of intervals with challenging behavior (using partial interval recording at a 10 s interval) for Jamie

	Average Percentage of Intervals	Range of Percentage of Intervals
Baseline	*M* = 66%	33% - 100%
FCT	*M* = 32%	0% - 75%

Table 3. Average and range of percentage of intervals with challenging behavior (using partial interval recording at a 10 s interval) for Ethan

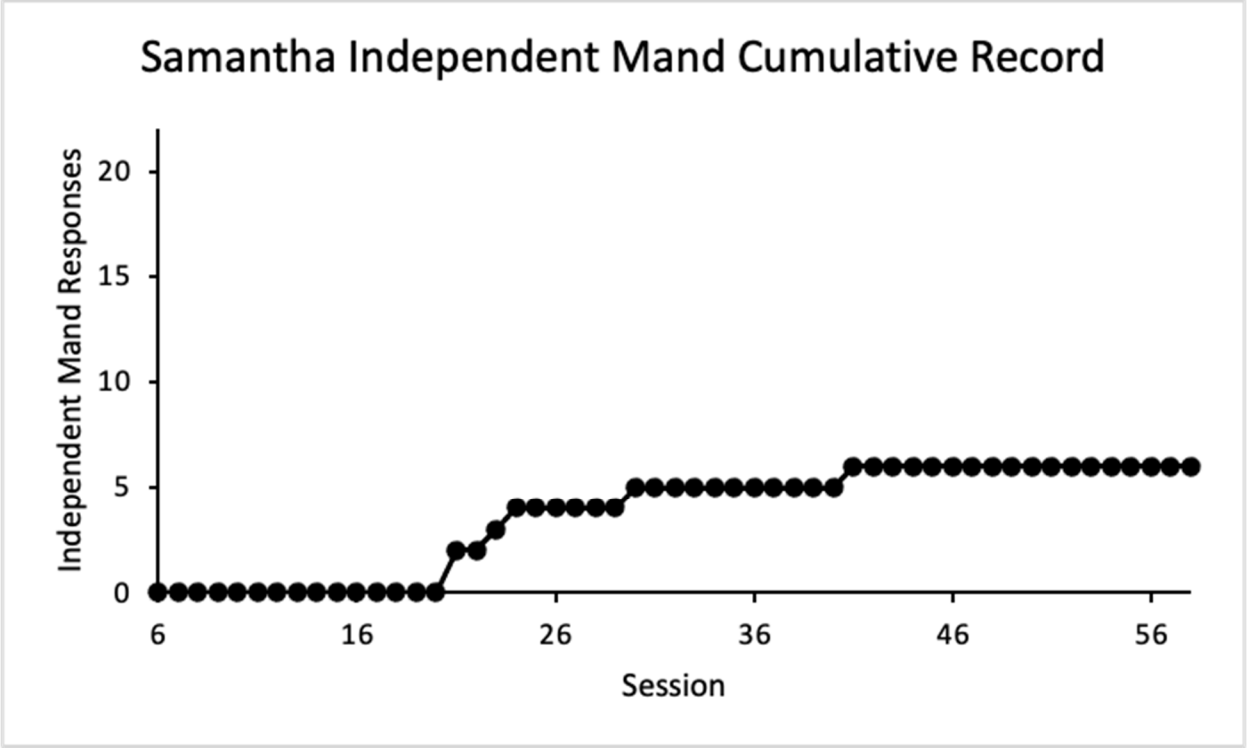

Figure 3. Cumulative record of independent mand responses for participant 1, Samantha.

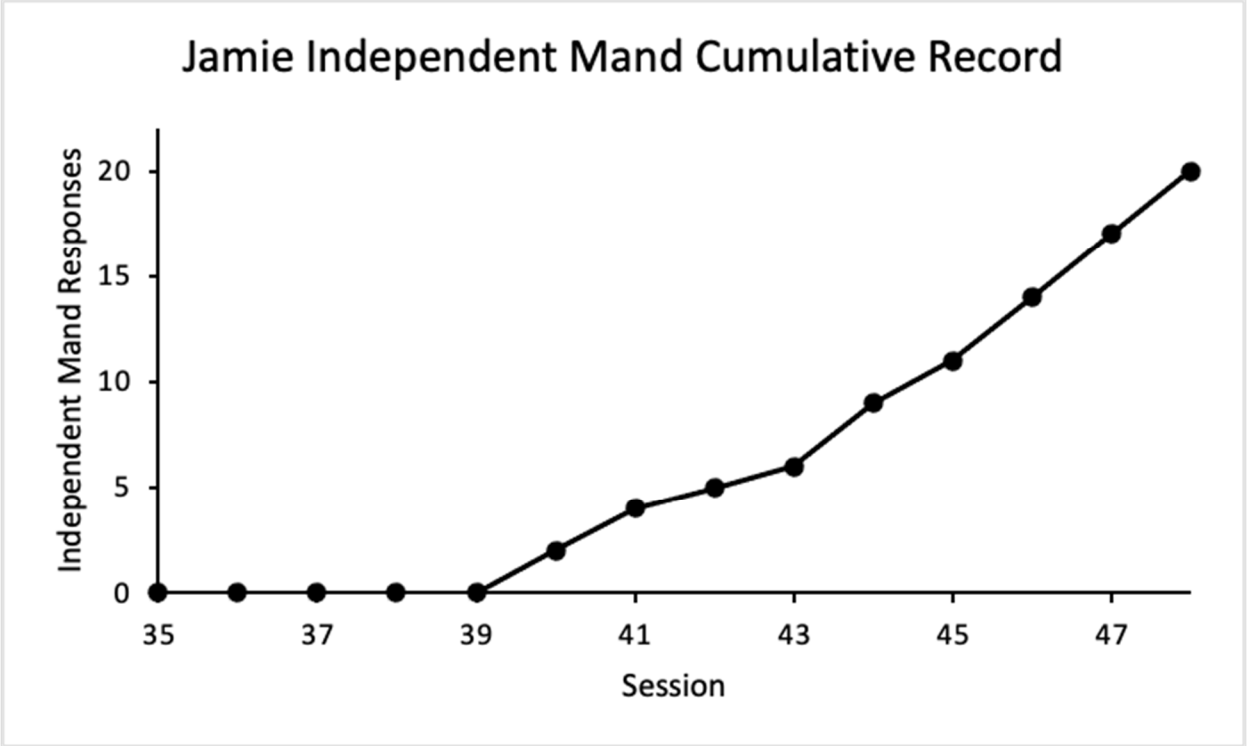

Figure 4. Cumulative record of independent mand responses for participant 2, Jamie.

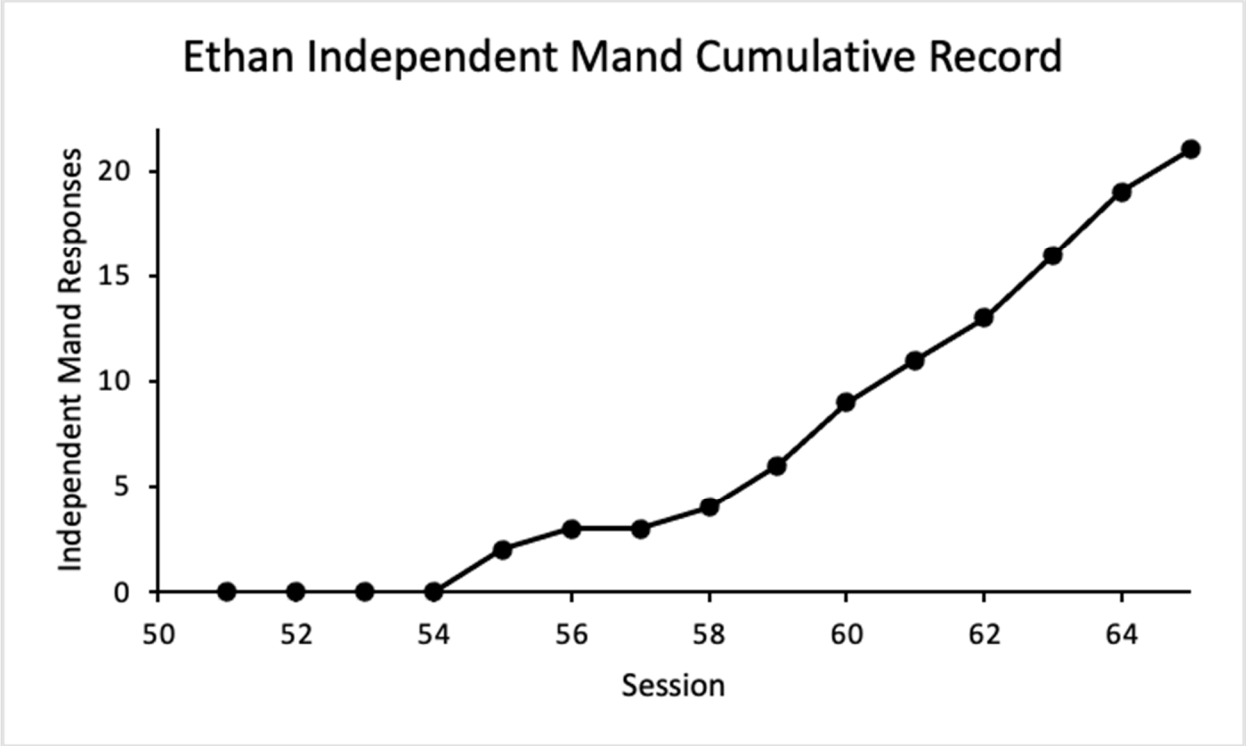

Figure 5. Cumulative record of independent mand responses for participant 3, Ethan.

Social Validity

This study concluded by administering a social validity survey to three staff members who did not participate in data collection in each participant's classroom. One teacher completed the survey regarding one participant included in this study. For Samantha, her teacher indicated that she strongly agreed that it is essential for students with developmental disabilities to learn appropriate means to refuse non-preferred items or activities. She was neutral regarding the benefit of participating in this study. She did agree that Samantha engaged in less problem behavior when presented with non-preferred activities outside of this study. For Jamie, his teacher indicated the option of strongly agree to all questions included in the survey. For Ethan, his teacher also indicated the option of strongly agree to all questions included in the survey.

CHAPTER 4

Discussion

Current FCT literature that uses negative reinforcement often involves conducting a functional analysis prior to intervention, however, there are some drawbacks to conducting a traditional functional analysis (Iwata & Doizer, 2008). These drawbacks include that they can be timely and delay intervention implementation and that potential maintaining functions of behavior are sometimes not properly captured by a traditional functional analysis outlined by Iwata et al. (1994; Iwata & Doizer, 2008). The purpose of this study was to investigate if FCT that employs negative reinforcement can be used to train appropriate means of refusal of non-preferred activities in the absence of a functional analysis. Overall, results of this study are inconsistent across the three participants.

Using a multiple probe across participants design, researchers evaluated: (a) latency to challenging behavior or an independent mand response from the presentation of the non-preferred activity, (b) percent of intervals of challenging behavior using partial interval recording, (c) and total count of independent mand responses. Jamie and Ethan reached the mastery criteria of independently manding to remove the activity for three out of three trials with no problem behavior across three consecutive data collection sessions following 13 and 14 sessions of FCT, respectively. These results provide some evidence that FCT using negative reinforcement without conducting a functional analysis can be successful to train mands to appropriately refuse non-preferred activities. Samantha independently did not consistently engage in the target mand response, and these responses were at relatively low rates when compared to the other 2 participants. Figures 3, 4, and 5 show that Samantha only engaged in the

target mand response for a total of 6 times, while Jamie and Ethan engaged in the target mand response a total of 20 and 22 times, respectively.

Given that two (Jamie and Ethan) of three participants successfully learned the mand "No" to refuse non-preferred activities, there is some evidence to support the conclusion that FCT using negative reinforcement can be successfully implemented with students with ASD in a school setting. The participants that did reach mastery criteria during FCT also began allocating their responding to the target mand instead of challenging behavior. This produced an inverse effect between the target mand response and challenging behavior, meaning that in the trials where the independent mand response occurred, Jamie and Ethan did not engage in any instances of challenging behavior. The last three data points of the FCT conditions for both Jamie and Ethan show that the percentage of intervals with challenging behavior was reduced to 0% when they engaged in the target mand for all three trials within a session. This study also investigated if the mand response taught (i.e., "no") would generalize to untrained activities. Results of generalization probes with Jamie and Ethan provide some evidence to support that the target mand taught during FCT sessions generalized to untrained non-preferred activities. Results of the social validity survey completed by Jamie's teachers also indicated that he used the target mand "No" outside of this study to refuse non-preferred activities and items around the classroom.

Limitations

Results of the study are limited by a number of factors, namely limited generalizability to other populations and the potential for overgeneralization of the target mand response. Since the three participants included in this study all had a diagnosis of ASD, the generalizability of the results to populations outside of the ASD community is limited. Future research may explore implementing this intervention with participants with other developmental disabilities.

Additionally, this study did not control for overgeneralization of mand responses. During FCT sessions, participants were given an inter-trial break after an independent or prompted mand response where they could access other items in the classroom. It is possible that participants learned the mand response to access preferred items in the classroom, and therefore overgeneralizing the trained mand response to situations other than escaping the non-preferred activity. To add additional stimulus control, potential changes to the FCT condition could include a positively reinforced FCT condition to train mands to access preferred stimuli in addition to the negatively reinforced FCT condition to teach refusal of non-preferred stimuli. Adding the positive reinforcement procedure could provide more control for the possibility of overgeneralization of the negatively reinforced mand (Groskretuz et al., 2014). Further investigation of negatively reinforced FCT might consider replicating the positively reinforced FCT condition to provide additional stimulus control for overgeneralization of learned mand responses.

Another limitation of this study is the use of a least-to-most prompting hierarchy after instances of challenging behavior. Prompting after occurrences of challenging behavior can present issues with developing prompt dependence or forming unwanted behavior chains (Landa et al., 2022), which Samantha's results represent. Given that she engaged in independent mand responses during the FCT with increased pre-exposure and with positive and negative reinforcement and eventually extinguished by the conclusion of the study as shown in Figures 2 and 3, both prompt dependency and the formation of unwanted behavior chains could potentially explain the inconsistency in observed findings. Although least-to-most prompting strategies help to control for prompt dependence, some additional safeguards to include in interventions are (a) a delay to reinforcement, such as a progressive time delay (Ledford et al., 2019), (b) a most-to-

least prompting strategy to help fade prompting over time (Ledford et al., 2019), and (c) an enhanced differential reinforcement procedure to include higher quality reinforcers (Cividini-Motta & Ahearn, 2013). Current literature on prompt dependency argues that the most effective prompting strategy will depend on the individual's unique history with prompt dependency (Zarcone & Jones, 2014). Future researchers should consider implementing additional controls for prompt dependence, as well as avoiding implementing this intervention with individuals who have a history of prompt dependence. The formation of an unwanted behavior chain can also help explain the inconsistent results in the case of Samantha. Since the participants were prompted to engage in the mand response following challenging behavior, a behavior chain of engaging in problem behavior, being prompted to engage with the mand response, and then receiving reinforcement could have been created. Potential alternative prompting strategies to control the formation of unwanted behavior chains include a delay to reinforcement through a time-out procedure or preemptively prompting before challenging behavior occurs (Landa et al., 2022).

Given that Samantha did not consistently engage in the target mand response, there is a possibility that escape from the non-preferred activity was not serving as a reinforcer for engaging in that response, and there were additional functions to take into consideration. In addition to information gathered during the NRRS prior to baseline, the baseline condition was able to provide some confirmation of an escape function that maintained the participant's challenging behavior. Results from a full functional analysis may have provided some explanation for why this particular intervention was not effective for Samantha.

Considerations for future research include selecting behaviors with strong establishing operation, as well as including a delay to reinforcement at the conclusion of FCT sessions.

Research indicates that selecting behaviors with strong establishing operations present often leads to higher rates of the acquisition of new skills (Iwata et al., 2000). Due to the nature of a multiple probe across participants design, there is a potential that participants adjust to the conditions of an experiment if the establishing operation does not remain at high levels throughout intervention (Ledford & Gast, 2018). Additionally, given that individuals with a history of discrete trial training are trained to be compliant with task demands and activities (Yi et at., 2006), these threats become more apparent in this population if an individual is exposed to an activity multiple times. Future research could explore the effect of FCT on behaviors with weak and strong establishing operations to help establish effective control for these adaptation threats.

The mands trained during the FCT condition served as a replacement behavior for challenging behavior. This study helped to confirm that manding for the refusal of non-preferred activities serves as a replacement for challenging behavior by demonstrating an inverse relationship between engagement in the mand response and challenging behavior for the participants who reached mastery criteria. Additionally, results of the generalization probes for both Jamie and Ethan provide some evidence that mands can generalize to untrained activities, which can help an individual with self-advocating in their natural environment. As indicated by the results of the social validity survey conducted with the participants' teachers, teaching individuals with developmental disabilities to refuse aversive stimuli is an important skill. It should be emphasized that while FCT was effective for two out of the three participants in this study, future research should consider adapting the procedures to include additional controls of the limitations discussed above.

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