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The Effects of Simultaneous Script-Training and Fading Procedures on the Mand Variability of Children with Autism

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THE EFFECTS OF SIMULTANEOUS SCRIPT-TRAINING AND FADING PROCEDURES ON THE MAND VARIABILITY OF CHILDREN WITH AUTISM

by

Kristen N. Kelley

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ABSTRACT

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by

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Utah State University, 2013

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Individuals with autism often display rote and repetitive responding across behavioral topographies. One area that is often affected is the individual's verbal repertoire. In an attempt to build and expand verbal repertoires, script and script fading procedures have often been implemented to teach individuals new and varied verbal behavior. Script training and fading procedures have also been used specifically to remediate deficits in an individual's mand repertoire. Researchers have examined the effects of script training and fading procedures on the variability within an individual's mand repertoire. This line of research is of great importance since a lack of variability in mands can limit an individual's access to desired and/or needed items as well as social interactions. In the present study, we implemented simultaneous script training and fading procedures to increase the variability of mands used by three preschool-aged children (one male and two females) diagnosed with autism. We implemented these procedures in an attempt to promote mand variability using antecedent only procedures

and to teach variability explicitly in our script training and fading preparation. It was also our goal to address some of the limitations that arose in the previously conducted mand variability studies, namely, the suppression of the default mand frame.

At the conclusion of the study, and following procedural modifications, all three participants demonstrated an increase in variability of mand frames. This increase was observed following the inclusion of extinction procedures and following low levels of variability while using antecedent-only procedures. Participants in this study demonstrated an average of one mand frame following antecedent-only procedures and this increased to an average of three mand frames following the inclusion of extinction procedures. The combination of the antecedent procedures and extinction further increased variability across participants. The need for the extinction condition led to many limitations in this study including the limitations analyzed in the simultaneous script training and fading procedures.

(90 pages)

PUBLIC ABSTRACT

The Effects of Simultaneous Script-Training and Fading Procedures on the Mand Variability of Children with Autism

Kristen N. Kelley

A recent report published by the Center for Disease Control indicates that the rates of autism prevalence are increasing. Statistics gathered in a 2008 census state that 1 in 88 children are diagnosed with an autism spectrum disorder (ASD). One of the primary deficits for individuals diagnosed with autism is found within their communication and language, which can limit an individual's access to social opportunities, learning opportunities, and most of all having their needs and wants met. In an attempt to increase language and communication skills among this population, researchers and clinicians have introduced scripted (recorded or written) sentences and phrases.

In this study we introduced four scripted phrases, to teach three individuals diagnosed with autism, different ways to request for desired items. Procedures used in conjunction to the scripts were designed to promote additional variability in their responses. For example, researchers were instructed to only attend to varied requests, which required the participants to use different phrases in order to receive the requested item. At the conclusion of the study all of the participants demonstrated the ability to use the four scripted requests as well as new requests not specifically taught.

These effects offer additional treatment options for individuals diagnosed with autism and have the potential to increase their ability to access a plethora of items, activities, and new experiences.

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To everyone else that has had a part in my past, present, and future, I have learned something from each and everyone one of you and you have helped me reach my goals.

Kristen N. Kelley

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INTRODUCTION

Mand Variability and Autism

A recent report (2012) published by the Center for Disease Control indicates that the rates of autism prevalence are increasing. Statistics gathered in a 2008 census state that 1 in 88 children were diagnosed with an autism spectrum disorder (ASD). Many individuals diagnosed with autism demonstrate deficits in social and verbal communication. These impairments are often marked by a lack of eye-to-eye gaze, limited to no verbal and/or vocal communication, and the existence of challenging behaviors of various topographies (American Psychiatric Association [DSM-IV-TR], 2000). Furthermore, individuals with autism often demonstrate very rigid and rote patterns of responding (American Psychiatric Association [DSM-IV-TR], 2000). These patterns of responding can be observed in their daily routines, toy play, as well as language. In terms of language, these patterns of rigid or rote responding are often observed in echolalic responding or a lack of variability in language. More specifically, individuals with autism may perseverate on topics or repeatedly use the same verbal response in a given context. For example, the individual may always respond to a greeting, by saying "I'm fine, how are you?" While this response would be appropriate given that the other individual had asked the person how they were doing, it is not an appropriate response to a simple "hello."

Individuals with autism also frequently display a diminished mand repertoire. The mand, or request, is an important verbal operant that is controlled by current motivating operations and allows us to access desired items as well as terminate aversive

experiences. The mand repertoire may be deficient for a variety of reasons, including the relationship between the mand and the consequences in the environment, specifically, that the individual has not experienced the relevant reinforcement contingencies (e.g. child requests juice → provided with juice). Another reason the mand repertoire may be deficient is that the individual has not been exposed to the relationship between the behavior (mand) and the resulting consequence (delivery of requested item). In addition, an individual may demonstrate a deficient mand repertoire in terms of the variability of mands. For example, the individual may only be able to request using the mand "I want _____." While this response is effective in many contexts, it may not always result in the desired consequence. For example, if an individual wants to terminate an activity and simply states, "I want no more," they may not contact the desired consequence. In some contexts, the inappropriate grammatical structure of a request may result in social disapproval, which may also result in undesirable consequences, such as, challenging behavior and an overall decrease in manding.

In order to address the challenges with response variability, a variety of procedures have been evaluated within the basic research literature as well as the applied research literature. Basic researchers have investigated the effects of different reinforcement schedules, extinction, and the role of the discriminative stimulus on response variability; while applied researchers have further examined antecedent procedures, such as multiple exemplar training and script training and fading in combination with consequence-based procedures, such as extinction, have also been examined (Betz, Higbee, Kelley, Sellers & Pollard, 2011; Sellers, Higbee, Snyder, & Kelley, 2011).

Extinction has been shown to increase responding and response variability. This effect has been demonstrated across many behavioral topographies, including challenging behavior. Goh and Iwata (1994) demonstrated this effect when examining the persistence and variability in the rates of self-injury and aggression following extinction. The participants demonstrated an initial increase in self-injury when the researchers implemented extinction. In addition, the authors also observed an initial increase in aggression when self-injury was placed on extinction.

Researchers have also looked at response variability as a product of interventions containing both antecedent and consequence procedures (Betz et al., 2011; Gates & Fixsen 1968; Lalli, Zanolli, & Wohn et al., 1994; Lee, McComas, & Jawor, 2002). These procedures teach new responses while also exposing the individuals to the relevant contingencies including the discriminative stimulus for the response and the reinforcement provided for appropriate responding. For example, Lalli et al. (1994) examined extinction-induced variability in toy play. The researchers taught play topographies across an array of toys and, after teaching, only reinforced new, or novel play responses. The results indicated that once they were taught new play responses, and once extinction of existing play behaviors was introduced, the participants began to demonstrate new play topographies.

Although there has been research conducted on interventions to increase general response variability, little research has been conducted specifically on the best procedures to increase mand variability. The following review of the literature will highlight the research conducted in the area of behavioral variability, as well as those procedures that have been investigated to increase mand variability specifically (e.g., script and script-

fading procedures). This review is crucial in the understanding the methods for the subsequent research.

LITERATURE REVIEW

Variability

Basic Research on Variability

Many behavior analytic researchers have investigated mechanisms that have an effect on response variability in non-human organisms and have demonstrated that behavioral variability is an operant, something that is controlled and changed by consequences. In addition, basic research studies have investigated the effects of varying reinforcement schedules on response variability. One such study, conducted by Blough (1966) demonstrated that pigeons could respond with variable inter-response times (IRT) following training, or the delivery of reinforcement for IRT's that occurred least frequently, therefore indicating that when provided with reinforcement for responding variably, pigeons were able to engage in response variability. A study conducted by Antonitis (1951) highlights the effect of extinction on response variability. The results from this study demonstrate that when reinforcement was withheld rats increased their variability in response location and while this behavior, as is true for other animal studies, an increase is still observed.

Gates and Fixsen (1968) conducted a study that investigated the effects of alternating between extinction, a continuous reinforcement schedule and a variable-interval schedule. The results of this study indicated that when alternating between the schedules, an initial increase in variability was observed when extinction was implemented. Other studies have investigated the relationship between reinforcement schedules and variability, without extinction. More precisely, the studies include

information about the relationship between fixed-interval (FI) (e.g. Boren, Moerschbaecher, & Whyte, 1978), continuous reinforcement (CRF), variable-ratio and extinction schedules (Eckerman & Vreeland, 1973), reinforcer intermittency (Schoenfeld, 1968) and response variability. The results of these studies include, an observed increase in variability as the FI schedule increased; variability increased to the greatest levels when feedback was delivered on a CRF schedule followed by a VR schedule; variability decreased slightly under extinction conditions. In addition, Schoenfeld (1968) compared FR and VR schedules and found that variability was directly related to the intermittency of reinforcement, demonstrating that the two schedules produced relatively equal variability. These studies, taken together, highlight the impact that reinforcement schedules have on response variability.

A study conducted by Pryor, Haag, and O'Reilly (1969) is a prime example of basic research on variability. In this study, the authors trained a porpoise to produce variable responding. Namely, the porpoise was trained to respond in novel, or not previously observed, ways. The researchers reinforced novel responding while putting previously reinforced behaviors on extinction. In other words, the first time the porpoise engaged in new behavior reinforcement was delivered. The porpoise would demonstrate the last reinforced behavior at the beginning of each new session. Once that behavior was placed on extinction, the porpoise would begin to emit novel behaviors such as corkscrews, tail flapping and swimming figure eights, thus increasing response variability over time. By the end of the study, the behaviors become too complex for researchers to document. This study demonstrates the role of reinforcement and extinction on producing response variability. Reinforcement strengthens behaviors and when no longer delivered

for a previously reinforced behavior, can lead to new behaviors in order to receive the same consequence.

Denney and Neuringer (1998) added to this area of research, conducting a study that examined the control of a discriminative stimulus on response variability. Two conditions were included in the study, each including a different discriminative stimulus (S^d). In the vary condition, rats were reinforced for varying their response sequence, while in the other condition reinforcement was delivered following any response. Reinforcement in the two conditions was yoked, in other words, equal amounts of reinforcement were provided in each condition. The target response in both conditions was lever pressing on two levers that were simultaneously present. The rats were first reinforced for any lever press, regardless of which lever it was, followed by responding to each of the two levers individually. The second phase (switch) was conducted by only making reinforcement available on one lever. The target lever was switched after reinforcement was delivered five times. The results from this experiment demonstrate that while the difference in levels of variability across the two conditions was itself variable, with some rats varying at much higher rates in the vary condition while other rats did not demonstrate much difference across conditions. Even with the differences in the amount of observed variability, the researchers did observe that all rats demonstrated more variability in the vary condition. These results indicate that when provided with appropriate S^d's and reinforcement, organisms can vary when the trained S^d is present. In other words, the organism can be taught to respond variably when the contingencies in place, reinforcement, favors doing so.

Applied Research on Variability

Researchers have also documented factors that influence and procedures that produce variability with human subjects, including individuals diagnosed with autism. For example, Lee et al. (2002) and Lee and Sturmey (2006) conducted studies that examined the effects of lag schedules on variable responding on the part of individuals with autism. A lag schedule of reinforcement is where the same response form will only be reinforced if it is separated by a pre-determined number of other responses. For example, in a Lag 1, the first time a student replies to the question "What do you like?" with "Pizza" reinforcement is delivered. If they repeat the same answer when asked the same question, reinforcement is withheld. Reinforcement is not again delivered until the student replies to the question "What do you like?" with an answer other than "Pizza." Lee et al. (2002) specifically investigated the effects of a Lag 1 schedule of differential reinforcement (DRA) on the variable responding to social questions for individuals with autism. Three participants, ages 7, 7, and 27 years, were included in this study. Baseline session included procedures in which participants were reinforced for every appropriate response to a social question (e.g. "What do you like?"). In the DRA/Lag1 condition, only appropriate responses that were different from the previous response within that session were reinforced. Results indicated that two of the three participants increased their varied responding following the Lag1 schedule. In a follow up study, Lee and Sturmey (2006) examined the effects of a Lag1 schedule in conjunction with preferred stimuli. Three participants between the ages of 17 and 18 were included. All three had a diagnosis of autism and used vocal language. Following baseline conditions, which were on a Lag0 (every response was reinforced regardless of variability) schedule, three Lag1

conditions were conducted in which the percentage of preferred stimuli available was altered between, 0%, 50% and 100%. More specifically, in 0% conditions, no preferred stimuli were present, in the 50% condition half of the available items were preferred, and all items in the 100% condition were preferred. The items were paced on a table, next to the participant, serving as an antecedent for responding. Once the participant engaged in a varied response, they were given access to one of the items on the table. So, while the stimuli were delivered contingent on responding, the placement of the items prior to the start of the session served as antecedent control. A reversal to the Lag0 condition was also included in this study. Results indicate that while the Lag1 schedule increased the variable appropriate responses for two of the three participants, there was no correlation between rate of variability and the percentage of available preferred stimuli in the environment, therefore indicating that the schedule of reinforcement, in this case, was the primary factor in the participants variable responding.

In another study, Miller and Neuringer (2000) studied the effects on behavior when the variability of response topographies itself was reinforced. Their study consisted of five individuals with autism as well as five adult and five child control participants. All participants were presented with a computer game containing two response buttons. Reinforcement was delivered on two different schedules, each within its own condition. In the first reinforcement condition (PROB1), participants contacted reinforcement after 50% of their responses. This reinforcement was delivered randomly and was not dependent on the pattern of button pressing. In the second reinforcement condition (VAR) the participants were only reinforced if their button pressing responses were different in their pattern from previous responses. There was then a reversal to the PROB

condition (PROB2). Participants' relative frequency (RF) values were calculated throughout the study and are based on likelihood the participant would emit each pattern of responding, with lower RF values indicating more variable responding. Results of this study, which are only discussed for those diagnosed with autism, demonstrate that three of the participants RF values were lower during the VAR condition and remained lower in the reversal (PROB2) condition, indicating that variability increased when it was reinforced and maintained following reinforcement. RF values remained similar across conditions for a fourth participant and RF decreased sharply in the PROB2 condition for the fifth participant.

The previously discussed studies demonstrate the ability of individuals to learn to vary their responses under a variety of conditions and reinforcement conditions. The research reviewed below documents and describes one specific teaching tool that has been effective in teaching individuals with autism new responses, and when introduced in conjunction with varying reinforcement schedules and contingencies expands the research on variability with humans.

Script and Script-Fading

In order to increase the number of responses within a verbal repertoire, many procedures have been explored. One tool that has commonly been used and has been effective in teaching individuals new verbal responses is script training and fading procedures. As script training has been one of the primary procedures used to increase mand variability in the recent research in this area, a brief description of these procedures and the research behind them is provided in this section. Script training and fading

procedures have been used to teach individuals with autism a variety of new verbal skills including, conversational exchanges, conversation within play, social initiations, general social interactions and, more recently, to increase response variability. When using script training and fading procedures, a written or auditory script is presented to the participant, typically immediately in front of the participant, and they are prompted to follow the script word-for-word. Following successful script following, the scripts are faded out, typically from back to front and word-by-word. The ultimate goal is that the script is completely faded and the participant continues to emit the scripted phrase without any prompting.

Krantz and McClannahan (1993) described the effects of script fading procedures on teaching children to initiate to peers. In this study, the authors taught four participants to initiate conversation to peers by using their name or by orienting themselves to the peer and vocally a question or statement. Social initiations were initially taught within three art activities (drawing, coloring & painting) via textual scripts, where the exact phrase to be vocalized was typed out and printed (e.g. “Do you want to play?”). The words making up the scripts were pre-taught to 100% accuracy following the baseline condition. In baseline, the participants were given the instructions “Do your art and talk a lot.” Following baseline, script training and fading sessions were conducted. In the script condition, the same instructions were provided, but this time in a written format. In addition, ten written scripted phrases were placed in front of the participant. These phrases included statements and questions such as “[Name] do you want to use one of my _____?” Physical guidance was used to prompt the participant to follow the scripts. Following prompt fading, the scripts were then faded word-by-word from back to front.

Generalization sessions were then conducted in a different environment, with puzzles and with a different instructor.

The results of this study show that all four of the participants increased their independent initiations to peers. In addition, unscripted phrases, defined as questions or statements varying from the scripted phrases by more than prepositions, tense, articles, pronouns or conjunctions, increased following the last phase of script fading. These results maintained in the follow-up sessions, one month after the conclusion of the study, for three participants. The effects did not carry over into the generalization sessions and therefore, the scripts were re-introduced.

In another study, Krantz and McClannahan (1998) incorporated scripts into children's activity schedules in order to train appropriate initiations to familiar adults that were context appropriate. The participants were all young children with autism and each exhibited a small expressive repertoire, typically one word mands or tacts. The scripts consisted of "Look" and "Watch me" and were taught via vocal and manual prompting which was subsequently faded. Specifically, the scripts were faded by cutting one third of the scripts off at a time, from back to front. Following script training and fading, all three of the participants increased their scripted initiations, unscripted initiations, and elaborations.

Stevenson, Krantz, and McClannahan (2000) also investigated the role of script and script fading procedures on social interactions by implementing auditory scripts with children with autism and examining the effects on their interactions with an adult. The authors taught the children new responses through scripts played via a Language Master®, a computerized system that vocally models a scripted word or phrase as

indicated by a card that is moved through the device (e.g. “I like to eat pizza,” “What is your favorite food?” and “Do you have a pet?”). Scripted initiations were scored in two categories, Scripted 1 interactions were those phrases that were emitted immediately after the participant heard the script and Scripted 2 were those scripted statements and questions that were emitted following hearing a script earlier in the day.

Interactions were structured from the child’s activity schedule and the researchers prompted participants through each step using graduated guidance and then fading to spatial fading and shadowing. No vocal prompting was used in the study. Script fading, like in other studies, consisted of the words of the script being deleted from back to front. Following script training and fading, the participants increased their scripted and unscripted vocal interactions with the known adult.

In 2009, Reagon and Higbee used script and script fading procedures as well as parent training to increase children’s vocal language within play. In this study, the authors taught parents to implement script procedures within the context of sets of toys. One toy set was used in the training sessions while two other sets were designated for generalization sessions. During the training sessions, the parent placed three auditory scripts on or near the toy set. If the child did not use of the recorded scripts within 15 s of the start of the session or if there was a lapse of 15 s between scripts, the parents manually prompted the child to press one of the script buttons. Once the child correctly used each of the three scripts across two sessions, the script was faded from back to front. Results of this study show that all three of the participants acquired the scripts, were able to respond following complete fading of the scripts and began to emit unscripted responses across toy sets. This study highlights the tendency of children with autism to

engage in rote and invariable responses prior to being taught an array of responses forms and the resulting variability following the teaching of the new responses.

Based on the research reviewed above, research on reinforcement schedules, antecedent and consequence based procedures, and script training and fading procedures, it appears as that the combined used of these procedures has the potential to increase the size of an individual's repertoire as well as promote variable responding. The studies reviewed below depict an emerging line of research that conjoins antecedent (script training and fading), consequence (extinction) based procedures.

Mand Variability

Betz et al. (2011) used script and script fading procedures, both in the absence of and in combination with extinction, to teach three children with autism new mand frames and investigated the resulting variability in their manding. Following an initial baseline phase in which all reinforcement was delivered following every complete mand frame, the three mand frames (e.g. "Can I have some _____", "May I please have _____", " I would like _____") were taught, using auditory scripts (delivered via small electronic devices that played the script when a button was depressed), in succession, each separated by a return to baseline phase and a first response reinforcement + extinction (hereafter called "extinction") phase. In the extinction phase of this study, the first time a participant used a different mand frame within a given session, reinforcement was delivered, while all subsequent repetitions of the mand frame were placed on extinction. Each script used in this study was associated with a colored sticker that was placed on the small electronic device.

The authors were interested in the effects of extinction alone, training new mand frames and the combination of the two on novel mand frames. Manual, hand over hand prompting to push the auditory script button, and vocal, to imitate the scripted frame, prompting was used during script training and fading sessions and the scripts were faded word-by-word from back to front once the participant demonstrated independence with the each script.

The results of this study indicate that the script training and fading procedures, in combination with extinction, were effective for two of the three participants. As the results of the study were significantly different for the first two participants compared to the third, I will describe the results separately. The first two participants demonstrated complete acquisition of the scripts and the scripts were completely faded. Each of the participants demonstrated an increase in novel mand frames over the course of the study. Participant 1, Jill, demonstrated between zero and one novel mand frames across baseline sessions while participant 2, Travis, used one novel mand frame across all baseline sessions. In the first extinction phase Jill increased the range of novel mand frames to between zero and two while Travis continued to emit one novel frame, indicating that extinction alone was not effective at producing varied responding. Following the first script training phase, Jill used between zero and three novel frames and Travis used between one and two. In the last extinction phase of the study, after participants had acquired all three new mand frames, Jill used up to four novel frames and Travis used up to five frames. The data from this study suggest that variability was dependent on the combination of teaching the scripts while also implementing extinction procedures due to the little no variable responding prior to script training and fading. It is also important to

note that participant 2 was anecdotally observed engaging in challenging behaviors, including screaming, crying and non-compliance, across extinction conditions, indicating some possible adverse consequences of this condition and extinction contingencies. While the behaviors decreased in frequency and intensity they were often still present when the consequence-based procedures were put into place potentially altering his variable responding.

The results for participant 3, Drew, varied from the first two participants. In the initial baseline condition, Drew used one novel frame while in the first extinction phase he used between one and two novel frames. These results, across all participants, indicate that extinction alone was not sufficient to produce variable manding. . This pattern continued in the extinction condition following the first the first script training phase but by the last extinction phase, Drew was only using one novel frame.

Drew did demonstrate an increase in novel mand frames but required an alternative intervention to do so. This alternative intervention consisted of a multiple script presentation phase in which all three scripts were presented simultaneously, using the voice recorder buttons, and the participant was prompted to rotate between the scripts using the same prompting procedures previously described (i.e., partial physical and vocal prompts). Following fading of the scripts in the multiple script format, the stickers associated with each script were placed on the participant's placemat and he was then prompted to rotate mand frames using on the stickers as cues. Prompting was then faded but the stickers remained in front of the participant. Therefore, these data suggest that for some individuals it may be necessary to not only teach new responses but to also teach all

responses together, and specifically reinforce variability, and for some participants also including visual cues.

Interestingly, for the participants in this study, novel frames also increased as each new script was acquired with the largest increase being observed during the extinction phase following the acquisition of the third script.

Some of the limitations found in the study conducted by Betz et al. (2011) included the tendency of the participants to only emit the mand frame taught in the most previously conducted script training and fading phase before a contingency (extinction) required variability, as well as the lack of variability prior to the alternative intervention for the third participant.

Based on the research conducted by Betz et al. (2011) and the limitations that came out of this study, Sellers et al. (2011) conducted a second study to evaluate the use of scripts and script fading on mand variability. The authors implemented multiple script training and fading (MST), presenting each of the scripts individually in succession, one immediately after the other within each training session to teach new mands, as well as extinction (first response reinforcement + extinction) to promote variability. The decision to use the MST procedures versus the sequential script teaching procedures used in Betz et al. was in an attempt to mitigate the chances of the scripts acquiring tight stimulus control which might inhibit variable responding. This effect was observed in the Betz et al. (2011) study as demonstrated by the tendency of the participants to use the script most previously taught in the sessions immediately following the script training and fading condition before extinction was implemented. In this study, the three new scripts were taught simultaneously and rotated within a session versus one script being taught to

completion prior to the introduction of the next script. Sellers et al. also used textual scripts (i.e., sentences typed on pieces of paper) instead of the auditory scripts used in the Betz et al. study. Three text scripts were used ("I would like ____," "Please give me ____," "May I have _____") and each was presented, one at a time, throughout the session in a predetermined order based on a random sequence generator. The participants were prompted to follow the scripts using manual and vocal prompting. The scripts were faded, simultaneously, after the participants used all of the scripts with 100% independence (in the absence of prompts). The scripts were faded word-by-word from back to front with the exception of the last word, which was eventually faded to the first letter of first word of the script.

Conditions within this study included, baseline, extinction, multiple script training, return to baseline, and simultaneous script presentation. Generalization to the natural setting was also evaluated.

During baseline sessions, no scripts were present and all complete mand frames were reinforced. In the first response reinforcement + extinction sessions, scripts were still not present and mand frames were only reinforced the first time they were emitted. Multiple script training consisted of the three scripts being rotated within a session as described previously. The participant was manually and vocally prompted, to follow and vocalize the scripted phrase, if they did not follow the script independently. For participants who did not demonstrate variability, a simultaneous script presentation phase was included. In this condition, the first letters of all three scripts were presented together at the same time. The participant was manually and vocally prompted, using point prompts to each script, light hand-over-hand prompting to follow the script, and word-by-

word vocal prompts to correctly emit the script, not only to vocalize the scripted phrase but to also vary between all three frames.

The results of this study are similar to those in Betz et al. (2011) in terms of the extinction phases, in that extinction prior to script training did not produce variable responding. Results differed from Betz et al. (2011) in that the scripts were not completely faded for any of the three participants; instead they were only faded to the first word for all three participants, and while they did begin to respond more variably, the production of novel mand frames was limited. During the Multiple Script condition, scripts were faded to the first word in 9-12 sessions. For all participants, the use of the default mand frame drastically decreased during this condition to zero or near zero levels. The participants almost solely used the three scripted mand frames being taught in this condition. While this condition did increase variability, it also produced an undesirable consequence, the suppression of the default mand frame.

In the sessions following the first multiple script training phase, a return to baseline was implemented. Participants 1 and 3, Nicodemus and Barstow, demonstrated no variation in their responding and while there was an initial increase in variability for participant 2, Michelle, by the end of the extinction condition, she had ceased responding altogether, potentially pointing to adverse consequences of extinction procedures. The researchers then implemented a return to the script-training phase to ensure that all participants could produce all of the scripted phrases. Following a return to the script training phase, a slight increase in variability was demonstrated.

Due to the small increase in variability produced by the multiple script presentation and extinction conditions, a simultaneous script presentation condition was

introduced for all three participants. In the simultaneous script presentation condition, the first letter of each of the three scripts was placed in front of the participant. For the Michelle, each of the letters were removed following the emission of each the scripted mand frames so that the remaining letters functioned as discriminative stimuli to promote the other responses. After Michelle used each of the frames all of the letters were replaced. The letters were not removed for Nicodemus and Barstow, and remained in the same location throughout each session while rotating locations from session to session. No additional prompts were provided in this phase, the presence of the letters was the only cue for Nicodemus and Barstow to use the scripted mand frames and to vary between them. This phase resulted in an increase in variability for participants when compared to the extinction conditions. In the simultaneous script presentation condition, Nicodemus used between two and four different mand frames, Michelle used between three and four different frames, and Barstow used three different frames across session within this phase.

Purpose Statement & Research Questions

Based on the research reviewed here, primarily that of Betz et al. (2011) and Sellers et al. (2011) and the limitations presented in the two studies, namely, the small increases in variability observed in some participants, the inability to completely fade the written scripts in Sellers et al. (2011), and the potential adverse consequences of the extinction procedures, including the possible suppression or decrease in responding and the challenging behaviors that may result from the implementation of extinction, the goal of this study was to extend this line of research by examining other methods to increase mand variability. As reviewed, for some participants, extinction suppressed responding at

times to near zero levels and/or suppressed the use of the default mand frame completely. Additionally, the results of the simultaneous script presentation procedure used in Betz et al. and Sellers et al. where visual cues (i.e., colored dots, written letters) were successfully used to produce mand variability, suggest that antecedent procedures may play an important role in controlling mand variability for some participants. Because the antecedent procedures used in previous studies were implemented following extended exposure to extinction conditions, the effect of antecedent procedures in the absence of extinction is unknown. Given the above-mentioned potential problems with the use of extinction in some participants, the investigation of variability promoting procedures that could be used in the absence of extinction, seems warranted. Therefore, one of the primary goals of this study was to increase variability without implementing extinction procedures. Instead we first examined the effects of simultaneous script training and fading on mand variability without exposing participants to extinction sessions. We also made changes to the way that scripts were introduced and taught, by having all scripts simultaneously present (including a script for the default frame to promote its continued use) and using gestural prompts to vary between scripts, in an attempt to loosen stimulus control and thus facilitate mand variability. When these procedures ultimately proved to be ineffective in producing response variability, we subsequently exposed participants to extinction conditions and measured its effects on mand variability.

The specific research questions addressed in the study included:

1. To what extent do simultaneous script training and fading procedures alone, increase the total number of different mand frames used by children diagnosed with autism?

2. To what extent does simultaneous script training and fading procedures, have on the number of scripted, unscripted and novel mand frames?
3. To what extent do the results gathered in a structured setting generalize to a typical snack session?
4. If antecedent only manipulations do not increase mand variability, to what extent does extinction in combination with the antecedent manipulations increase variability?

METHODS

Participants

The participants in this study were 3 preschool-aged children. All of the children had a diagnosis of autism, determined by a primary care physician and/or school officials and were recruited from a university-based preschool that employs behavior analytic strategies as a method of intervention.

All of the participants had vocal language and were able to emit three to five word phrases. In addition, participants were able to request preferred items using only one complete mand frame (e.g. “I want _____”). The above skill set was judged by the researcher, through observations across instructional days, and reports from the student’s case manager at the university-based preschool

Natasha was a 5-year-old female diagnosed with autism. Natasha was a student at the university-based preschool for two academic years. Natasha communicated spontaneously using full sentences.

Olivia was a 4-year-old female with an ASD diagnosis and attended the university-based preschool for one academic year. Olivia used full sentences to communicate her wants and needs as well as commenting on her environment.

Brody was a 5-year-old male with a diagnosis of ASD and had attended the university-based preschool for one academic year. Brody communicated using complex vocal language, including full sentences across contexts.

Setting

All sessions were conducted in the preschool classroom. Pre-training sessions were conducted in both the child's individual work area and a separate research area located in an office within the classroom. All other sessions were conducted in the research area. The research area included a secluded cubicle with one table, two chairs and a covered bookcase. Generalization sessions were conducted at the typical preschool horseshoe-shaped snack table placed in a central location in the classroom. The generalization environment also included chairs for the participant, peers and researchers. The participant and peers also had colored placemats placed on the table directly in front of them.

Materials

The materials used in this study included printed word flash cards, which consisted of plain white paper with single words printed in black ink, and text scripts both printed with black ink on white paper and then laminated, edible items in clear containers, colored placemats, paper and pencil data collection materials, a timer and a video camera.

Response Definition and Measures

All student vocal responses were transcribed during each experimental session. Transcripts were then analyzed and responses were scored as (a) total number of complete mand frames, (b) total number of different mand frames, (c) occurrences of the default mand frame, (d) occurrences of the scripted mand frames, and (e) occurrences of

unscripted mand frames. These response definitions were in line with the definitions set out by Betz et al (2011) and Sellers et al. (2011) and were hypothesized to capture the different types of participant responses while also allowing for detailed response analysis across phases. In addition, these response definitions allowed for a demonstration of the possible effectiveness of the teaching procedures to teach new mand frames and promote mand variability. Data were collected across all settings and sessions (Appendices A and B). Only mand frames that were in the form of a complete sentence including a subject, verb and a noun were recorded. Each mand needed to include the name of an edible item, for example, "I would like a cookie**.**" If the participant used a scripted mand frame with added words that were descriptors of the edible item (e.g. big, pink) and/or the number of edible items (two M&M's), these were not counted as different or unscripted (described in detail below).

Independent responding was initially defined as the participant vocally emitting the mand frame that was different from the previously emitted mand frame with no prompting from the researcher. At script training (full script) session 23, script training session 20, and script fading level one (last word faded) session 13 for Brody, this definition was changed to address the participants' ability to vocally emit the scripted mand frame(s) without vocal prompting while the participants continued to need a point prompt to rotate between the scripts. This addressed the two responses that were initially necessary to move to a new fade level, both emitting the frames as well as varying. This modification was made due to the prolonged duration of script fading phases and the researchers concern with the potential for the participants to become dependent on a

certain fading level of the script, in other words not demonstrating vocal emission of the script when the next fading step was implemented.

Different Mand Frames

Different mand frames were defined as vocal requests frames that varied from frames previously used within the session by more than the addition or subtraction of "please," adding an adult name, stating the same words, of an individual script, in a different order, or requesting different edible items.

Default Mand Frames

The default mand frame was defined as the vocal request the participant uses prior to the start of the study. Natasha's default mand frame was "Can I have _____" while Olivia and Brody solely used "I want ____."

All sessions were video recorded and were later used for agreement and treatment integrity if these data were not taken during the session.

Scripted Mand Frames

Scripted mand frames were defined as any vocal requests that were identical to any of the scripts being trained with the addition of an available edible item. For Natasha, scripted mand frames included, "Will you give me _____," "I would like a _____," and "May I please get _____" while Olivia and Brody's scripted mand frames were "Can I please get _____," "May I have some _____" and, I would like a _____."

Table 1

Examples of Different vs. Not Different Mand Frames

Original Script	Not Different	Different
Will you give me	Will you give me _____ please	Will you give me some ___
	Jared, will you give me	Will you give me two ___
	Will you give me a chip	Will you give me red m&m
I want	I want cookies	I want some cookies, please
	I want chips, please	I want a few chips
	Daphne, I want m&m's	I want a chip and a cookie
May I please get	May I please get Cheeto	May I have some ____
	Kristen, May I please get	May I get a red m&m
	May I get ____, Daphne	May I get some ___
I would like a	I would like cookies please	I would like some ____
	Please I would like chips	I would like three m&m's
	I would like candy, Jared	I would like to get ____
Can I please get	Can I please get cookies, Daphne	Can I please have ___
	Can I get chips	Can I get some ____
	Jared, can I please get	Can I please get some ___
May I have some	May I have some chips, Kristen	May I please get ___
	May I have some cookies, please	May I please have some _____
	Please, may I have some candy	May I get a ____

Table 2

Examples of Scripted and Unscripted Mand Frames

Scripted Mand Frames	Unscripted Mand Frames
"I want cookie."	"Can I have a cookie?"
"May I have cookie."	"May I get a cookie?"
"I would like a cookie."	"I would like to have some cookies."
"Can I get a cookie?"	"I want to have two cookies, please."

Unscripted Mand Frames

Unscripted mand frames were defined as any vocal requests that were re-combinations across trained, scripted mand frames or used words not taught in the scripted frames, both in conjunction with an available edible item. For example, "Can I have some Oreo" was considered an unscripted mand frame.

Agreement and Treatment Integrity Measures

Interobserver Agreement (IOA) data was collected on 53% of sessions across all participants (Table 3). More specifically, IOA data were collected for 52% of Natasha's sessions, 60% of Olivia's, and 49% of Brody's sessions. An independent data collector scored IOA data either in person (during sessions) or via the video recording of the session. Agreements were defined as both data collectors recording the same occurrences of all mand frames, transcribing the same words within a mand frame and recording the same level of prompting, both verbal vs. physical, for each mand frame. We calculated agreement by dividing the number of agreements, across transcribed responses and

Table 3

Interobserver Agreement Percentages Across Phases

	Natasha	Olivia	Brody
Baseline	100% (100-100)	100% (100-100)	99% (98-100)
Script Training	95% (57-100)	100% (100-100)	100% (100-100)
Script Fading	98% (88-100)	96% (62-100)	99.5% (92-100)
Return to Baseline	100% (100-100)	100% (100-100)	98.5% (97-100)
1st Letter w/Lines	100% (100-100)	100% (100-100)	97.5% (95-100)
1st Letter w/Prompt	100% (100-100)	100% (100-100)	100% (100-100)
Return to Baseline 2	100% (100-100)	100% (100-100)	100% (100-100)
1st Letter w/Lines 2	100% (100-100)	N/A	N/A
1st Letter Only	100% (100-100)	100% (100-100)	98% (96-100)
1st Letter w/Prompt 2	100% (100-100)	88.5% (77-100)	100% (100-100)
Point Only	100% (100-100)	N/A	N/A
Generalization 1	100% (100-100)	N/A	N/A
1st Letter w/Prompt 3	100% (100-100)	100% (100-100)	100% (100-100)
Extinction	100% (100-100)	100% (100-100)	100% (100-100)
1st Letter w/Prompt 4	N/A	96 (96)	N/A
1st Letter + Extinction	N/A	100% (100-100)	N/A
Three Letters + Extinction	N/A	100% (100-100)	N/A
Return to Baseline 3	100% (100-100)	N/A	99% (96-100)
Extinction 2	100% (100-100)	N/A	100% (100-100)
Generalization 2	100% (100-100)	100% (100-100)	100% (100-100)

prompt levels, by the total number of responses in a given session and then multiplying by 100%. Total IOA across participants was 98.5%, with 99.5% agreement for Natasha, 98.7% for Olivia, and 99.4% for Brody. IOA in the baseline phase was 100% for Natasha and Olivia and 99% for Brody; script training IOA was 95% for Natasha, 100% for Olivia, and 100% for Brody while the script fading IOA was 98%, 96%, and 99.5%, for Natasha, Olivia and Brody respectively. Interobserver agreement in the return to baseline phase was 100% for Natasha and Olivia and 98.5 for Brody. In the first letter with lines and the first letter with prompt phases IOA remained at 100% for Natasha and Olivia and was 91.5% and 97.5% for Brody. The IOA collected for Natasha remained at 100% across the remainder of phases within the study while IOA varied slightly for Olivia, all phases at 100% with the exception of the second first letter with prompt phase in which IOA was 88.5% and the fourth first letter with prompt phase in which IOA was 96%. IOA for Brody also continued to be at 100% across the remainder of phases with the exception of the first letter only phase which was at 98% and the third return to baseline phase in which IOA was at 99%.

Treatment Integrity (TI) data were collected (Appendix C) during 37.6% of sessions across participants (38% for Natasha, 38% for Olivia, and 37% for Brody) (Table 4). Treatment Integrity data were collected and scored across phases. The total number of components were divided the total number of correctly implemented components and then multiplied by 100%. The TI components included (a) providing the correct instruction (e.g. “It is time for snack.”), (b) waiting the full prescribed time prior to providing a consequence, (c) using the correct prompting procedures, (d) using and

Table 4

Treatment Integrity Percentages across Phases

	Natasha	Olivia	Brody
Baseline	100% (100-100)	100% (100-100)	100% (100-100)
Script Training	91.5% (83-100)	100% (100-100)	88.7% (83-100)
Script Fading	97.5% (83-100)	100% (100-100)	100% (100-100)
Return to Baseline	100% (100-100)	100% (100-100)	100% (100-100)
1st Letter w/Lines	100% (100-100)	91.5% (83-100)	83% (83-100)
1st Letter w/Prompt	100% (100-100)	100% (100-100)	100% (100-100)
Return to Baseline 2	100% (100-100)	100% (100-100)	100% (100-100)
1st Letter w/Lines 2	100% (100-100)	N/A	N/A
1st Letter Only	100% (100-100)	100% (100-100)	100% (100-100)
1st Letter w/Prompt 2	100% (100-100)	88.5% (77-100)	91.5% (83-100)
Point Only	100% (100-100)	N/A	N/A
Generalization 1	100% (100-100)	N/A	N/A
1st Letter w/Prompt 3	100% (100-100)	100% (100-100)	94% (83-100)
Extinction	100% (100-100)	100% (100-100)	100% (100-100)
1st Letter w/Prompt 4	N/A	100% (100-100)	N/A
1st Letter + Extinction	N/A	100% (100-100)	N/A
Three Letters + Extinction	N/A	100% (100-100)	N/A
Return to Baseline 3	100% (100-100)	N/A	100% (100-100)
Extinction 2	100% (100-100)	N/A	100% (100-100)
Generalization 2	100% (100-100)	100% (100-100)	100% (100-100)

delivering the correct edible items as defined by a preference assessment, (e) providing the correct consequences for the phase, and (f) collecting data. The researchers conducted sessions with 98% integrity with Natasha and Brody and 99% with Olivia.

Interobserver agreement and Treatment Integrity was low across a few conditions, including the second first letter with prompt and first letter with lines. Following sessions with low IOA and/or Treatment Integrity, additional training and component clarification was provided to the researcher. In addition, the video was reviewed and areas of needed improvement were identified.

Data Recordings and Confidentiality

The video camera was set up to the side of the participant in order to have an accurate view of the written scripts as well as most effectively capture the participant's verbal statements so that sessions could be accurately transcribed at a later time.

Pre-Training

Prior to implementing the research conditions, we conducted probes to assess each participant's ability to read the words that were then used in the written scripts. We also conducted pre-teaching sessions that included the words the participants did not independently and correctly read during the probes. During the probes and pre-teaching sessions, flash cards with the individual words were presented, for example, "Can."

Pre-teaching was conducted in two phases: single word and script following. Single word pre-teaching sessions consisted of 10 trials for each word not correctly emitted during the probes. A single flash card was held up and the participant was

provided with the vocal instruction “read.” The participant then had three seconds to vocally identify the word. Vocal praise was provided following a correct response. If the participant incorrectly read the card or did not respond, the card was removed and re-presented using the same instruction in conjunction with a word for word vocal prompt. Single-word pre-teaching was concluded when the participant correctly responded to each word for 80% of trials across two sessions without vocal prompts.

Script following pre-teaching was included in order to teach general script following. Script following pre-teaching consisted of a written scripts unrelated to those that were presented in subsequent experimental sessions. The unrelated script was presented to the participant and they were prompted to correctly follow the script, more specifically, to vocally emit the written words on the script in the correct order, using physical and vocal prompts. Physical and vocal prompts were faded as the participant followed the script independently. At this time, the script was then faded back to front, one word at a time, following independent script following during 80% of trials across two sessions. Script following pre-teaching ended when the participant followed the script for 80% of trials across two sessions when it was faded to only the first word, for example “The _____ _____ ___.”

Experimental Design

We employed a concurrent multiple baseline across participant’s experimental design with embedded reversals. The phases of the study included Baseline, Script Training, Multiple Script Fading, Return to Baseline, Return to Script Training (RSF): first letter with lines, RSF: first letter, first letter with prompt, first letter only, point only

(Natasha), Extinction (EXT), EXT: first letter, first letter single I (Olivia) and Generalization. Each of these phases will be described in detail below.

Preference Assessment

We interviewed staff and parents regarding highly preferred edible items to generate a pool of ten preferred items to be included in the study. The participants had limited access, varying between no access, to five or less instances per session, to the 10 identified edible items in their instructional setting during the study. Prior to each research session, we conducted a Brief Multiple Stimulus Without Replacement (MSWO) (Carr, Nicholson, & Higbee, 2000). The ten identified preferred items were placed on the table in front of the student at an equal distance apart from one another. The child was then presented with the instruction "pick one." Three trials of the MSWO procedures were run in order to identify the three most highly preferred items out of the array. These three items were then used for the duration of the research session.

Experimental Procedures and Conditions

Baseline

Baseline conditions mimicked those of the status quo environment. All complete and independent mands were reinforced by the delivery of the requested edible item. The participant was given the instruction, "It is time for snack" and then had the opportunity to request the available edible items. Three to eight baseline sessions, each five minutes in duration, were conducted prior to moving to the script training phase.

Script Training

All three scripted mand frames were taught simultaneously. We accomplished this by placing all three of the new scripts plus a script containing the participant's default mand frame in front of the student at the same time. All of the scripts were placed in a straight-line an equal distance apart from one another, directly in front of the participant. The scripts were rotated in the order they were placed on the table every session. If the participant did not respond for 5 s, the researcher pointed to one of the scripts as determined by a previously generated list using a random sequence generator (Appendix D). If the participant did not respond, or responded incorrectly, the researcher then pointed again to the script, physically guided the participant to touch the script, and gave a vocal prompt consisting of a word for word model of the scripted mand frame. The participant was also physically (hand over hand or pointing) and vocally prompted, by guiding the participants hand to each word while also providing a word for word vocal model, to use one of the scripts, following a previously generated random sequence, if the participant independently used the same mand frame twice in a row. For example, if the participant said "I want ____" twice, they were prompted immediately after they consumed the requested edible item, using physical and vocal prompts to follow one of the other frames. This criterion was modified for Natasha at script training session 22 because she began responding in a fixed pattern (always using her default frame twice in a row) that was preventing exposure to all of the scripts. Each time Natasha used her default mand frame, reinforcement was delivered and she was then immediately prompted to use one of the other scripted frames. Script training concluded and script fading began once a student independently used all of the scripted mand frames with 80%

independence, defined as vocally emitting the script with no vocal or physical prompts, across two sessions. This criterion remained the same for all subsequent script fading phases.

Script Fading

All three scripts were presented simultaneously and the student was prompted to move from script to script as described above. We faded the scripts from back to front, one word at a time, for example, “I would like a _____,” “I would like __ ____,” and “I would ____ __ ____,” etc. We faded all three scripts at the same time. Each fading step occurred once the participant independently followed the script, or emitted the full scripted mand frame with no prompts, during 80% of opportunities across two sessions.

Return to Baseline Phases and Probes

Following script training, script fading, return to script fading and extinction phases, we returned to baseline conditions to assess the participants’ mand variability in the absence of any scripts. Every full and independent mand frame was followed by the delivery of the requested edible item. We continued these phases until stable levels of variability were observed or for at least one session during return to baseline probes.

Return to Script Fading (RSF)

Following the initial script fading phase and a return to baseline, we reintroduced the scripts and implemented additional fading procedures. This included fading each letter of the first word of each script. More specifically, the scripts were again faded from back to front word-by-word until only the first word of the script remained. Once the first word remained, each word was faded letter-by-letter form back to front. This phase and

the varying modifications were necessary due to the small changes in the participant's mand variability following the initial script training and fading.

RSF: first letter with lines. In the first of the RSF phases, we reintroduced the scripts with only the first letter with just lines for all other words. For example, if the script was "Can I have ____," we reintroduced "C __ ____ ____." This phase was introduced as a way to continue to fade the scripts in a back to front format. All four of the scripted mand frames continued to be placed out simultaneously in front of the participant all in the same format. We continued to prompt the participants to move between the scripts in attempt to also teach varying between each script. This format continued to include the three new scripted mand frames as well as the default mand frame. All sessions in this phase were conducted using the same criteria as all other script training and fading phases.

RSF: first letter. Following independent responding in the absence of prompting across two sessions, we removed the lines from all of the scripts and presented only the first letters of each script. All four first letters were placed in front of the participant and sessions continued to be conducted using the same criteria as all previously conducted script training and fading phases, including prompting the participants to rotate between each of the scripts using physical guidance (light hand-over-hand), partial prompts (researcher pointing to each letter) and/or vocal prompts (researcher providing a word-for-word model of the scripted phrase).

RSF: first letter only. In this phase we presented only the first letter and did not provide any physical prompts to vary among the scripts. This was conducted to assess the participant's ability to recall the scripts with only the first letter as a cue and to assess the

participant's ability to vary between the scripts independently. Every occurrence of a scripted or an unscripted full mand frame was reinforced, including repetitions of full mand frames, in other words, there were no contingencies in place to encourage varied responding.

RSF: first letter with prompt. We introduced this when participants did not vary, or rotate, between scripts in the RSF: first letter only phase. This phase was a reintroduction of the last fading step where the participant was successful. In this phase, the only point prompts delivered were point prompts to vary script usage. These prompts consisted of the researcher only pointing to one of the scripted mand frames when the participant using the same mand frame twice in a row (once for Natasha if she used her default frame), or if the participant did not respond for 5 s.

Point only. (Natasha), We hypothesized that the point prompt alone may have been controlling Natasha's responding and variability. We designed this phase to assess the accuracy of this hypothesis. In this phase no letters or cues were placed in front of Natasha. The table was bare with the exception of the edible items, data collection materials and the timer. The researcher simply pointed to random spots on the table, as if the scripts were present, after Natasha used her default frame once or if she did not respond for 5 s. No vocal prompts were used during this phase.

First Response Reinforcement + Extinction (EXT)

Following the series of script fading procedures and return to baseline phases, we introduced first response reinforcement + extinction. In the initial extinction phase, we removed all scripts, leaving no letters or visual cues for the participant to emit a response, and reinforcement was delivered following the first occurrence of a full mand frame. Any

occurrence of the participant using a mand frame they had already emitted during that session was placed on extinction. For example, the first occurrence of “May I please have Oreo” → reinforcement with the delivery of an Oreo, while the second occurrence of “May I please have Oreo” → no reinforcer delivered, “Can I have a Oreo” → participant reinforced with the delivery of an Oreo.

EXT: first letter. (Olivia). Following first response reinforcement + extinction, we reintroduced the first letters of each of the four scripts to serve as a visual cue for varied responding for Olivia. The four first letters were placed in front of her and once she manded with one of the mand frames, that letter was removed. If Olivia used that response again prior to the re-presentation of the letter, the response was not reinforced. Following the use of all four scripts, and the removal of all four first letters, the letters were represented. At this time Olivia could then again emit each scripted frame again. This procedure was repeated for the duration of the session.

EXT: first letter single I. Following the extinction with the first letter Phase, we introduced an extinction phase that only included three of the four first letters for the scripted mand frames. One of the two “I” first letter was removed. This phase was only implemented for Olivia due to her difficulty with varying between the two “I” scripts.

Generalization

The final experimental condition consisted of the participants sitting at the snack table located in the common area of the preschool. The participants along with two peers, each who used numerous different mand frames, and two adults were present. Three different snack items were available for the participants and peers to request. The vocal

S^d, “It is time for snack” was provided to start the session. We recorded data on the number of full, independent mand frames, the number of different frames, and the number of scripted frames each of the participants used during the generalization sessions. Natasha and Brody participated in snack with the extinction contingencies in place while the first letters along with extinction contingencies remained in place for Olivia.

RESULTS

Figure 1 depicts the number of different mand frames each participant used across each phase of the study.

Baseline

Natasha

We conducted a total of five initial baseline sessions with Natasha. Her responding remained stable throughout this phase, using one mand frame in each session. The mand frame used across all sessions was her default, “Can I have _____”.

Olivia

Eight baseline sessions were conducted with Olivia. She too only used her default mand frame (“I want _____”) across all sessions in this phase.

Brody

Eleven baseline sessions were conducted with Brody. In 10 of the sessions he solely used his default mand frame “I want _____.” During Baseline session three, Brody used a total of three different mand frames, including his original “I want _____” frame plus two variations, “I want another Nerd” and “I want Nerd again.”

Script Training

We conducted script training until the participant used each of the scripts independently, or in the absence of physical and vocal prompts, for 80% of trials across two sessions. Script training lasted 23 sessions for Natasha, 20 sessions for Olivia, and 10

sessions for Brody. All of the participants consistently used between three and six different mand frames in this phase (Figure 1). Natasha and Olivia only used scripted mand frames, including their default. Brody used five different mand frames: all three new scripted frames and two unscripted frames, during two sessions. In another session, he used six different frames, including all four scripted frames and two unscripted frames.

We also began to analyze the prompts each participant needed to correctly respond beginning in this phase. In the script training phase Natasha averaged 65.4% independence (responding correctly in the absence of vocal and/or physical prompts) with a range of 40%-90%. Olivia responded at 71.4% (38%-100%) independence with a range of 38%-100%. Brody correctly emitted the scripts with an average of 58.3% (18%-94%) independence.

Script Fading

Natasha

In the initial script fading phases of the study, Natasha used all four of the scripted frames across two sessions. Natasha reached independence according to the new criteria within two sessions but was still not varying between the scripts without prompting. In script fading level two, where the last two words were faded, level three, last three words faded, and level four, no remaining words, Natasha continued to use three to four of the scripted frames. In each session, Natasha would use her default mand frame and two to three of the other scripted frames. Natasha's independence (initial criteria) remained low, while as observed in the data, Natasha was quickly and proficiently able to use the scripts

with only a point prompt. This indicated that she was able to recite the scripts but was not able to vary without additional prompting. Natasha met criteria to move from fade level one in two sessions, level two in three sessions, level three in two sessions and level four in five sessions.

Natasha's independence in this phase ranged from 40%-55% with an average of 49.6% across sessions.

Olivia

In script fading levels 1-3, Olivia used all four of the scripted mand frames in each session. During fading level four, there were two sessions in which Olivia only used three of the scripts, the default mand frame plus two of the other scripted frames. Olivia's independence was variable throughout the script fading phases, with the lowest percentages of independence in script fading level four. Olivia did, however, move quickly through the majority of phases following the criterion change indicating her ability to recite the scripts but inability to successful move between scripts without the point prompts. After the criterion change, Olivia met criterion in fade level one in two sessions, level two in two sessions, level three in three sessions and level four in 15 sessions. Olivia's independence across this phase ranged from 29%-92% with an average independence of 60%.

Brody

Brody used four to seven different mand frames across sessions in fade level one. Brody typically used the three new scripted frames and one to four unscripted frames. Brody rarely used his default or initial mand frame, "I want _____," during script fading

levels 1-3. This script was not prompted in order to provide additional exposure to the new scripts. Most of Brody's unscripted frames were variations on his default or one of the other scripted frames. More specifically, in this phase, Brody typically added the word "some" to the scripts. Brody's independence typically increased across the sessions within each phase. Brody remained in script fading phase one for 14 sessions. Once the independence criteria changed, Brody moved to fade level two in two sessions. This result is consistent with the other two participants, indicating that while he was able to follow the scripts, he was not able to vary between scripts at a high enough level of independence to meet our initial criterion.

During fade levels two and three, Brody used four or five mand frames, again primarily consisting of the scripted frames and a variation of a scripted frame by adding "some". Brody's independence increased across sessions but he still needed periodic prompts to move between scripts. During fade level four, Brody used between three and four scripted frames per session. All of the responses in this fading phase consisted only of the scripted frames and in this phase we also observed an increase in his use of the default mand frame. Independence during this phase decreased across sessions. These data may have indicated some prompt dependence, specifically dependence on the researcher's point prompt to vary between the scripts. Brody independently responded with this phase at an average of 74.6% of trials with a range of 50%-95%.

Return to Baseline

Following script training and fading, we returned to baseline conditions. During this phase, all three of the participants went back to only using their default mand frame.

For Natasha and Olivia this happened in session one. Brody demonstrated some variability initially when returning to baseline conditions. He used between used one and five different mand frames, eventually stabilizing at two: his default and "I want some."

Return to Script Fading (RSF)

Following the second baseline phase, we returned to script fading in an attempt to increase the number of mand frames used by each participant. We hypothesized that the initial fading steps were not sufficient to use the newly taught scripted frames. Therefore, we decided to include a phase where the scripts were reintroduced and faded more slowly, word-for-word until the first word at which point we began to fade letter-by-letter.

RSF: first letter with lines

We began by presenting the first letter of each script followed by blank lines indicating all other words of the script, for example, "C __ _____ ___." Natasha and Olivia were able to move on from this phase in three sessions, each using the scripted mand frames needing only a point prompt across two sessions at 80% or better. Brody moved on after two sessions. All participants used at least four frames by the end of this phase. Brody also demonstrated one additional frame, "Can I have" which was a recombination of two of the scripted frames. Independence in this phase was 38.6% (33%-55%) for Natasha, 76% (69%-82%) for Olivia, and 67.5% (57%-76%) for Brody.

RSF: first letter

Following the first letter with lines, we moved to only presenting the first letter of

the first word of each script. All three participants met criteria, two sessions at 80% independence (no vocal or) in two sessions. Natasha and Olivia used four mand frames in this phase while Brody used four and five across the two sessions respectively. In this phase, Brody used the four scripted frames and one unscripted, “Can I have some”. Natasha responded correctly and independently an average of 52% (50%-58%) of trials while Olivia responded with an average of 83% (75%-91%) independence and Brody was independent an average of 80.5% (76%-85%) of trials.

Second Return to Baseline

Following the reintroduction of the scripts and the additional fading steps we again returned to baseline conditions to assess the participants’ independent use of the scripts. During this condition, all three participants returned to only using their default mand frame.

Second Return to Script Fading (RSF)

In order to reestablish the scripts into the participant’s repertoire, we again returned to script fading. We re-introduced the last step at which the participants were successful, first letter, and then introduced a new condition, first letter only. In the first letter only phase, we simply placed the first letter of all four scripts on the table in front of the participants and provided no prompts, including point prompts.

RSF: first letter

All three participants immediately returned to using the scripts when reintroduced. All three also continued to need point prompts to vary across scripts during

some of the trials and sessions. Natasha and Olivia demonstrated four mand frames during this phase while Brody used up to six mand frames. By the end of the phase, Brody was reliably using three frames, two scripted (May I have some" and "I would like a") and one unscripted ("Can I have some"). Independence in this phase was 46.33% (38%-55%), 48% (45%-60%) for Natasha, 62.66% (45%-70%), 48.66% (43%-58%), for Olivia, and 83.5% (74%-96%), 62.6% (46%-68%) for Brody.

RSF: first letter only

All prompts were removed from this phase in order to assess the participant's ability to move between scripts with only the visual first letter cues. Natasha did not participate in this phase do to our initial decision to test the point only prompt (described below). Olivia used four different mand frames in the first session of this phase, decreasing to two different mand frames across the remainder of sessions. Brody also participated in this phase, he used between one and five different mand frames during this phase eventually stabilizing at two.

Point only (Natasha)

When the scripts were removed and the researcher only provided a point prompt to different locations on the bare table Natasha's responding was stable at three different mand frames across sessions within the phase. In this phase Natasha responded with an average of 50.3% (46%-55%) independence across trials.

Brief generalization-point only (Natasha)

Once we observed stable responding in the point only condition, we assessed this procedure in the generalization setting. Natasha and two peers attended a typical snack

session. The researcher attended to all snack participants, reinforcing each complete mand frame with the requested edible item. The researcher also pointed to random locations on the table in front of Natasha. During this condition, Natasha used four different mand frames in the first session and three in the second. It was then decided that while this method increased and stabilized responding at a higher level then in baseline phases, this intervention was not clinically appropriate or feasible to implement in other settings. In addition, we wanted to investigate other potential interventions that would further increase the participant's variability.

First letter (Natasha)

After making the procedural changes for Natasha's intervention, we reintroduced a first letter probe. In this condition, we re-presented the first letter of each script in conjunction with the point prompt. This probe was introduced in order to re-establish some of the control of script following and variability with the scripts. In this condition Natasha reached independence for an average of 50% of trials.

First Response Reinforcement + Extinction (EXT)

While the initial goal of this study was to increase mand variability only using antecedent based procedures, we did not observe a consistent increase in variability only using these procedures. Because of the demonstrated effectiveness of first response reinforcement + extinction in previous studies (Betz et al. 2011; Sellers et al. 2011), we decided to implement this procedure with our participants. It was hypothesized that the acquisition of the new scripts, in conjunction with extinction, would produce additional response variability. We decided to include extinction procedures due to the response

patterns observed in the previous conditions as well as the low levels of variability. We observed the participants engaging in response patterns that included using the same mand frame multiple times in a row. This prohibited them from moving between frames. The extinction procedures promoted such variation.

Natasha

Upon introducing the initial first response reinforcement + extinction phase, Natasha used between three and four different mand frames. After one session with only three, her default and two of the scripted frames, Natasha increased to using four different frames, her default and all three of the scripted frames.

Following extinction, we returned to baseline conditions. Natasha initially used three mand frames but then went back to only using her default frame for the duration of the phase.

We then implemented a return to extinction and we immediately observed an increase to four frames. Natasha continued to use four frames for the majority of the phase; one session she only used one frame and three in another. By the end of the condition, she demonstrated stability in using her default and the three other scripted frames.

Olivia

Following the introduction of the initial extinction phase, Olivia did not demonstrate variability, only using one frame, her default frame, across sessions in the phase. We then returned to the last fade step in which Olivia was successful, first letter. After one probe session, Olivia was again using all four frames.

EXT: first letter. Once Olivia demonstrated the use of all four frames, we implemented an alternative intervention that consisted of presenting the first letter of each script in conjunction with extinction. Based on the data, we concluded that Olivia required a prompt to follow each of the scripts. Following the emission of a scripted frame, that letter was removed, and that script was no longer reinforced as was conducted in the study by Sellers et al. (2011). Once Olivia had used each of the four frames all of the first letters were represented. Therefore, Olivia was able to use the frames multiple times but only after she used each one in the array.

The results in this phase indicated that Olivia was not proficiently using all of the frames. Dependent on the order of the first letter, Olivia would use between two and three of the frames. Olivia did not readily demonstrate the use of "I would like a" represented only by "I" and would continue to use her default "I want," also represented only by "I."

EXT: first letter single I. Based on the results of the previous phase, the researchers removed one of the "I" scripts in an attempt to achieve stable variability between three scripts. All other procedures were the same as the first letter plus extinction phase. Once this modification was made, Olivia immediately used three scripts, her default, "Can I please get" and "May I have some." This was consistent across sessions.

Brody

Once extinction was implemented, Brody immediately began to use four different mand frames. In one session he used six different frames, his default, all three of the scripted frames and two unscripted frames ("Can I have" and "Can I have some"). By the end of the phase, Brody was consistently using four different frames, the three scripted

frames and “Can I have some.”

We then implemented another baseline condition and Brody’s responding decreased back to only using one frame “Can I have some.” A second extinction phase was then introduced and variability again increased, up to five different mand frames.

Generalization

Once all participants were successful at varying, either with extinction only, or with first letter plus extinction, generalization sessions were conducted. Each participant attended a typical snack session with two peers who used complete mand frames and have numerous frames in their repertoire. Natasha and Brody participated in snack with only extinction contingencies in place while Olivia continued to use the first letter plus extinction procedure.

During generalization, Natasha used a total of six different mand frames, her default, all three of the scripted frames and two unscripted frames, “Can I have my” and “Can I have some.” Olivia used three mand frames, her default, “Can please get” and “May I have some.” Brody, used the highest number of different mand frames in the generalization setting, using a total of seven different frames, including, “Can I have,” “Can I have some,” “Can you give me,” “Can I please get,” “Give me a,” “May I please have some” and “Will you give me.”

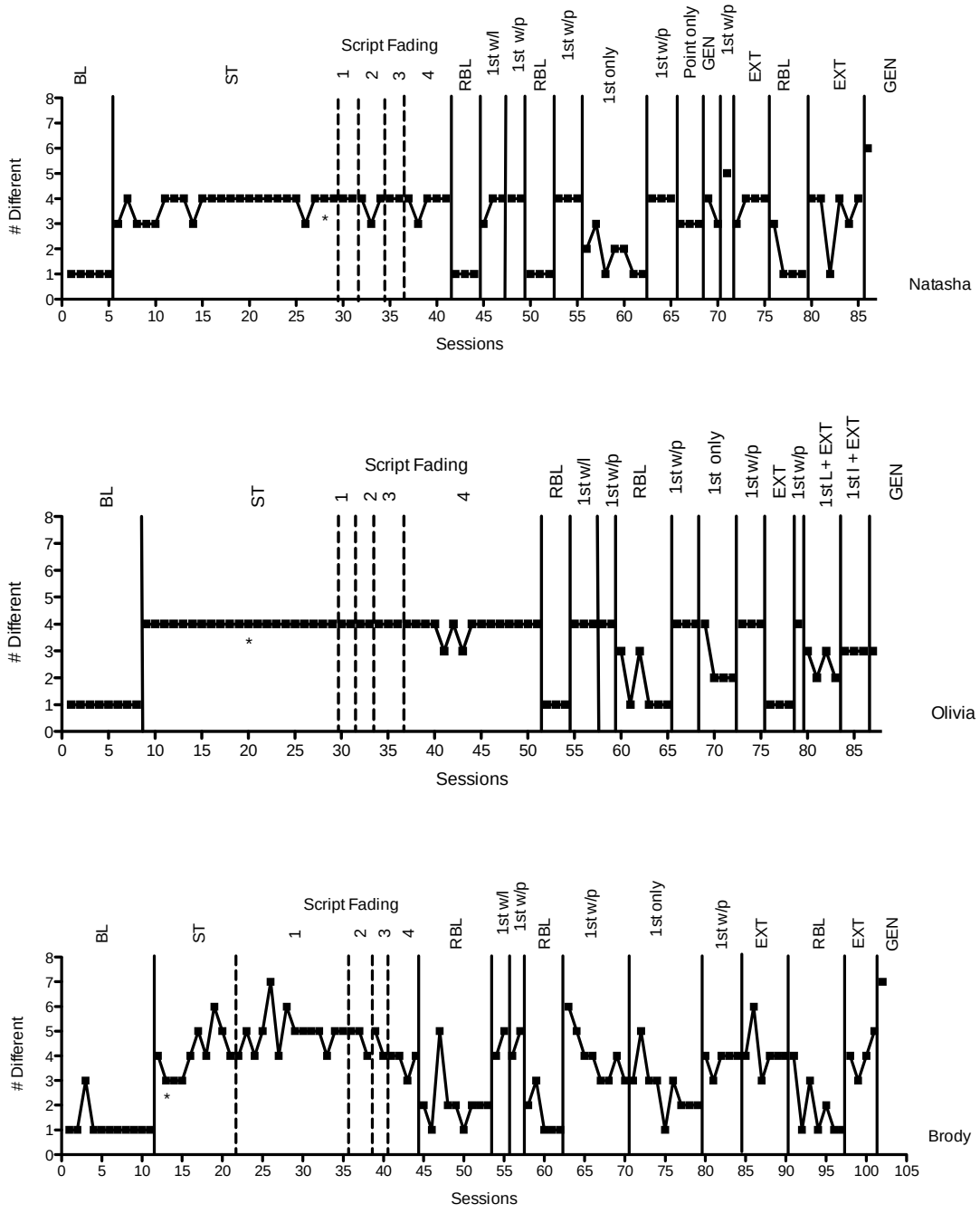

Figure 1. Each participant's number of different mand frames. The numbers and dashed lines in the script fading phase indicate individual fading steps. The asterisk represents the criteria change for script independence.

DISCUSSION

The purpose of this study was to investigate procedures to increase the mand variability of young children with autism. Furthermore, we set out to extend the work of Betz et al. (2011) and Sellers et al. (2011) and to examine procedures that would possibly address some of the limitations of these studies including the suppression of responding, especially the suppression of the mand frame the participants used prior to the study. Specifically, we examined the effects of a simultaneous script training and fading package that included gestural prompts to vary on the participants' mand variability and how these results would generalize to the natural environment (generalized snack setting).

We began by implementing antecedent only interventions, simultaneous script training and fading, in order to address the limitations observed in the Sellers et al. (2011) study, primarily the adverse consequences of the extinction procedures, namely the suppression or decrease in responding observed in some participants following the implementation of the extinction condition.

We began this study by further examining the effects of script and script fading procedures. These methods have been well documented in the research literature (e.g. Krantz & McClannahan, 1993,1998) and are supported as an effective technique in increasing language. Furthermore Betz et al. (2011) and Sellers et al. (2011) documented the effectiveness of script training and fading in the area of mand variability. While these studies demonstrate the usefulness of this intervention in increasing vocal language when teaching one script at a time to completion, or rotating through scripts within a session, these procedures do not address teaching an individual specifically to vary, instead

attempting to incorporate cues to vary within other procedures which we hypothesized may increase mand variability at higher rates than the other studies. Therefore, this study attempted to combine the teaching and fading of the scripts while simultaneously teaching the participants to vary between them. This was done by implementing simultaneous script training and fading in which all scripts were presented to the participants at the same time, the participants were prompted to vary between scripts and all scripts were faded simultaneously. It was the hypothesis of the researcher that the procedures implemented in this study would not only continue to be effective in teaching individuals with autism new mand frames but that presenting all of the scripts together would also assist in the acquisition of the behavior of varying between the scripts.

The results of this study indicate that while we did see ultimately produce increased levels of mand variability across the three participants, the simultaneous script training and fading procedures alone were insufficient to produce this increase. Rather, an extinction component was necessary to increase mand variability. Because of the sequence of conditions in the study, we cannot be clear as to whether extinction alone would have been effective with the participants or if the package of the simultaneous script training and fading with extinction was required to see the increase in mand variability that were demonstrated in this study. Based on the results of previous studies (Betz et al., 2011; and Sellers et al., 2011), it seems unlikely that extinction alone would produce the observed effects. We cannot rule this out as a possibility, though. We can make some conclusions as to deficiencies in the procedures to promote variability. Our results do indicate that the participants did learn the scripts included in this study and that when paired with extinction, we can promote higher rates of mand variability. These

results are consistent with the results gathered in the Betz et al. (2011) and the Sellers et al. (2011) studies further demonstrating that both teaching new responses and putting in place a contingency that requires variability are likely necessary to produce varied responding.

These results also indicate that consequence based procedures in conjunction with the antecedent procedures seem to be necessary. One possible reason for this pattern within the results is that our teaching procedures are suited for teaching new responses, or new mand frames, but alone are not sufficient in teaching the participant to vary. Furthermore, all of the participants in this study as well as the studies conducted by Betz et al. and Sellers et al. had a history of very structured teaching procedures including numerous opportunities to receive prompts for correct responding, frequent reinforcement, correction procedure that often includes brief extinction followed by another opportunity to display the correct response.. This history may have influenced the results observed in this study by not providing clear contingencies for the participants and may have influenced their overall response pattern. This history potentially decreased the likelihood of mand variability due to the lack of structure typically present in the teaching environment.

The results observed in the generalization setting, increased mand variability across participants, may have occurred for numerous reasons. One conclusion is that the participants have a history of the contingencies that are in place during the typical snack setting. The participants had experienced the typical snack setting for many months prior to the start of this session. In this setting they contacted reinforcement in the form of an edible for using a complete mand frame. Another conclusion is that the participants

engaged in the increased number of mand frames due to the peer models involved. All of the participants had prior experience with peer interactions and the peers involved with this condition demonstrated many different mand frames during the generalization settings. While it is unlikely that the participants' responding was directly influenced by the presence of peers in this way, it is a possibility that cannot be ruled out.

It is important to note, that while we were trying to increase mand variability, it was not a specific goal of this study to increase novel mand frames. In fact we did not observe novel responding on the part of any participant during the course of the study, until the introduction of the generalization condition. In the generalized snack setting Brody used two novel mand frames, "Give me a ____" and "Will you give me ____."

The more prevalent concern in this study was the prompting procedures used to promote variability. We used physical and vocal prompting procedures to assist in the teaching of varying between the different scripts. These prompting procedures were included due to the previous research on mand variability and script training fading procedures and research. It has been documented in the current body of literature that physical and vocal prompts are effective in teaching new response forms using scripts and were specifically documented in the studies conducted by Betz et al. (2011) and Sellers et al. (2011). We also chose these procedures with the intention to not only teach new responses but to also promote response variability within the same sessions in an attempt to identify and effective and efficient procedure to increase mand variability. In spite of previous research and the intentions with the current prompting procedures, this type of prompting may have actually had negative effect on mand variability. These effects include prompt dependence and perhaps a decrease in overall mand variability.

Prompt dependency was observed with Natasha and the results in the point only condition. It is unknown as to whether or not these prompting procedures did aid in teaching the participants to vary or if it hindered possible effects.

Limitations and Future Directions

In this study, we set out to extend the research on mand variability conducted by Betz et al. (2011) and Sellers et al. (2011) and to address some of the potential limitations to those studies. In addition, we attempted to increase mand variability using only antecedent manipulations. The second goal, however, was not accomplished. While the results did not support our hypothesis, they provided additional insight into the factors that are potentially controlling mand variability.

One limitation of this study is the small number of participants and previous exposure to tightly controlled instruction with clear contingencies, including clear reinforcement contingencies, frequent prompts and opportunities to display the correct response, that may have created a history of responding under those contingencies and creating a lack of responding under the new contingencies present in our procedures. Therefore, the lack of consequence-based procedures may have influenced their progress. More specifically, the participants included in this study also participated in skill acquisition programming that included multiple, tightly structured, teaching trials, each including a clear S^D and a clear consequence consisting of reinforcement or the removal of attention followed by a representation of the trial with a prompt.

Without the consequence-based procedures, the participants' exposure to the reinforcement contingencies in place for correct responding was limited and only

occurred after prompting. This may have led to prompt dependency on the part of the participant. This mimics a more typical structure of the trials that are implemented to teach a new skill during typical learning sessions including, presenting an instruction, providing a prompt and providing the appropriate consequence. This structure and the contingencies are clear to the participant and they are given numerous opportunities to contact prompts to teach a skill and numerous opportunities to contact reinforcement.

Furthermore, the participants all had a history of using a single mand frame across contexts and environments. This mand frame had been heavily reinforced and had produced desired results in terms of meeting their wants and needs. This single mand frame typically contacted reinforcement across environments and across numerous people further strengthening this response.

When the participant has a history of having his or her wants and needs met using a single response form, the reinforcement for a new response may need to be consistent and dense in order to compete with the reinforcement contacted by the emission of the default frame. When attempting to teach three new mand frames while also attempting to promote variation between the new response forms and the previously acquired default frame, the current schedule of reinforcement may have been insufficient. One possible remedy would have been to make the reinforcement schedule denser in frequency and intensity, for example, providing reinforcement for prompted responses or for simply using a different mand frame regardless of the sequence. Future research should extend this work with additional participants, with varying levels of teaching history, manding abilities, the schedules of reinforcement and looking into different environments.

Another limitation in this study is the lack of success the procedures implemented had on teaching the participants to vary between acquired or known scripts. The script training and fading procedures did successfully teach the participants new mand frames but they were not successful in teaching the participants to independently move, or vary, between mands. There were numerous factors involved within this study and it is believed that there were too many behavioral expectations included in the procedures, including following each of the scripts, following required prompts and varying between each of the four scripts. That is, the procedures may have been more successful in producing mand variability if the mand frames were taught prior to teaching the participants to vary between them. Future studies should investigate the effects of teaching the new mand frames in one condition and then prompting to vary in another. The combination of these two conditions may produce higher rates of mand variability than were produced in this study. Furthermore, it is hypothesized that the contingencies in place more directly addressed the teaching and the acquisition of the scripted frames versus variability. The participants contacted reinforcement for emitting a frame and the reinforcement for varying may have been lost within this. Future studies should modify the teaching procedures to more specifically teach the participants to vary across responses. Due to the fact that the antecedent procedures implemented in this study alone did not produce sufficient mand variability, perhaps including more specific variability teaching procedures, for example, including different conditions for script acquisition and another to teach varying would have increased mand variability.

Due to the addition of extinction in the last phases of the study, an additional limitation is the small number of conclusions that we can make regarding the compound

effects of our procedures and the introduction of extinction. Due to the fact that we did not include an extinction condition prior to any script teaching phases, we cannot conclude that the extinction procedures alone or the compound effects of our procedures would not have produced similar results with this group of participants. Future research should further analyze the role of extinction in conjunction with the simultaneous script training and fading procedures, implementing a component analysis of the procedures used in this study.

Another area in which the body of literature should be extended is in the area of novel responding. While novel responding was not the explicit goal of this study it is an important skill. Future researchers should investigate possible procedures that would result in increased mand variability in addition to the participants responding in novel ways. One specific area in which this may be addressed is in the number of frames taught. In this study as well as in the Betz et al. (2011) and Sellers et al. (2011) studies only three new mand frames were taught. This study increased the array by including the default mand frame, this preparation was included due to the results seen in previous studies in which the participants decreased, and in some cases, completely stopped emitting their default mand frame. It was the goal of this study to preserve the default mand frame within the participant's repertoire. While this study did teach the participants three new mand frames while also maintaining the default mand frame perhaps larger effects would have been observed in terms of new combinations, or unscripted frames as well as novel mand frames if the participants were taught a larger array of mand frames.

Finally, in an attempt to examine procedures to increase variability in the absence of extinction, future researchers should explore other consequence-based interventions, in

conjunction with and without script training and fading. One area that should be investigated is the effect of differential reinforcement on mand variability. More specifically, providing greater amounts of a desired item when the participant varies his or her mands. This change to the current procedures may act as a cue to vary in conjunction with providing reinforcement for the emission of a scripted mand frame. This modification would perhaps address the limitations seen with the current procedures in which the participants successfully acquired the scripted frames with the simultaneous script presentation but did not demonstrate variability without the introduction of the extinction procedures.

Implications and Conclusions

While this study extended the work of Betz et al. (2011) and Sellers et al. (2011), it also provides researchers and clinicians with additional questions. The results of this study indicate that for this set of participants, the combination of antecedent interventions with extinction produced the most stable rates of variable responding. For two of the participants, Natasha and Brody, these procedures produced relatively high rates of variability. Each participant emitted mand frames that were not included in the script training and fading procedures. . In addition, the procedures implemented in this study allowed for the scripts to be completely removed for two of the three participants. This is an area within the general script literature that is not well addressed. The apparent stimulus control of the scripts, as well as the stimulus control of the point prompt observed in this study, presents obstacles when teaching a person to engage in variable

responding. One primary question may be: how to transfer the control from the scripts while also prompting variability between the scripted phrases.

The most critical implication of the research conducted here is that antecedent procedures alone did not produce variability in mands. While there were benefits to the procedures, namely the removal of the scripts for two of the participants and the continued use of the default frame, antecedent procedures alone were not sufficient to produce variability in manding. The fact that extinction produced the desired variability in two of three participants provides further evidence for the importance of using contingencies that require variability when attempting to increase varied responding.

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APPENDICES

APPENDIX A

Baseline Condition Data Sheet

Baseline Condition
Participant: _____

Date:_____ **Instructor:** _____ **Session Number:** _____ **Reli Taken? Y N**

Session Instructions: Provide the requested edible following each ***full mand*** (i.e., a full sentence containing a subject, verb, and noun). Do not reinforce any other mands (e.g., gestures, single words, or things like "Want M&M").

Data Collections Instructions: Write each mand used (even those that are not full mands, for example, "Chip please."). Tally word-for-word repetitions of a mand in the column next to the mand.

Mand (word for word)	Tally

Total FULL Mands	
Total DIFFERENT Mands	

Different Mand Frame Definition: complete sentences (i.e., contain a subject and a verb) differing from other mands already emitted the session by more than the addition of an adult's name, substituting nouns (i.e., the snack item name), or rearranging the word order, and adding/deleting "please."

APPENDIX B

Simultaneous Script Training and Fading Data Sheet

Simultaneous Script Training & Fading
Participant: ________________________

Date:_______ **Instructor: ______________________** **Session Number: ______** **Reli Taken? Y N**

Mand Frame Started With (circle): 1 2 3 **Fading Step: ___________**

If participant uses a taught mand frame ***WITHOUT SCRIPT PRESENT*** write in "NO SCRIPT"
If Unscripted: record mand frame word-for-word

Mand	Prompt Level	Sr+?
1 2 3 Default Unscripted	I PP Phys Verbal	Y N
1 2 3 Default Unscripted	I PP Phys Verbal	Y N
1 2 3 Default Unscripted	I PP Phys Verbal	Y N
1 2 3 Default Unscripted	I PP Phys Verbal	Y N
1 2 3 Default Unscripted	I PP Phys Verbal	Y N
1 2 3 Default Unscripted	I PP Phys Verbal	Y N
1 2 3 Default Unscripted	I PP Phys Verbal	Y N
1 2 3 Default Unscripted	I PP Phys Verbal	Y N
1 2 3 Default Unscripted	I PP Phys Verbal	Y N
1 2 3 Default Unscripted	I PP Phys Verbal	Y N
1 2 3 Default Unscripted	I PP Phys Verbal	Y N
1 2 3 Default Unscripted	I PP Phys Verbal	Y N
1 2 3 Default Unscripted	I PP Phys Verbal	Y N
1 2 3 Default Unscripted	I PP Phys Verbal	Y N

Totals

Script 1	Script 2	Script 3	Default	Unscripted	# of Diff.	Total

Different Mand Frame Definition: complete sentences (i.e., contain a subject and a verb) differing from other mands already emitted the session by more than the addition of an adult's name, substituting nouns (i.e., the snack item name), or rearranging the word order, and adding/deleting "please."

Simultaneous Script Training & Fading

INSTRUCTIONS

1. Provide the verbal cue "It's time for snack."
2. Start timer (5 minutes)
3. Allow 5 seconds for participant to mand
4. If a mand frame occurs: provide edible item
5. If no mand frame or no mand at all:
    a. Take participants finger and touch the script dictated by the generated order.
    b. Allow 5 seconds for participant to follow script independently
    c. If participant says script: provide edible item and score as "PP"
    d. If the participant does not emit the scripted mand within 5 seconds provide a physical prompt (place participant's finger under each word on the text script)
    e. If participant follows script: provide edible item and score as "Phys"
    f. If the participant still does not follow script within 5 seconds physically prompt (under each word) and give a verbal model
    g. If participant says script: provide edible item and score as "Verbal"
    h. If the participant still does not use the scripted mand, repeat step "f" until the participant engages in the scripted response or until the session ends (i.e., the full 5 minutes elapse).

APPENDIX C

Treatment Integrity Data Sheet

Treatment Integrity

Participant: _____ Date: _____ Session: _____

Researcher: _____ TI Data Collector: _____

a) Provided the correct instruction (e.g. “It is time for snack.”) Y N

b) Waiting the full prescribed time prior to providing a consequence Y N

c) Using the correct prompting procedures Y N

d) Using and delivering the correct edible items as defined by a preference assessment Y N

e) Providing the correct consequences for the phase Y N

f) Collecting data Y N

APPENDIX D

Sample Prompting Sequence

Prompt Sequence 1

3	2	1
4	4	1
4	4	3
2	3	2
4	3	4
2	2	1
1	3	3
2	3	1
3	3	4
1	1	3
4	4	3
4	4	4
1	2	1
2	3	3
4	3	2
3	4	2
1	4	2
1	3	1
4	1	2
1	4	2
1	2	3
2	1	2
4	2	1
2	1	2
2	1	3
1	4	3
3	4	2
1	4	3
2	3	2
4	2	1
4	3	1
1	4	3
2	2	4
1	1	3
4	4	4
4	3	3
3	1	2
3	1	2
1	2	1

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Expected Graduation Date: May 2013
Advisor: Dr. Thomas S. Higbee

Humboldt State University
1 Harpst Street
Arcata, CA. 95521
M.A. in Psychology
Specialization in Applied Behavior Analysis
Thesis: Effects of Sibling Training on In-Home Applied Behavior Analysis Programs and Attitudes Toward Children with Autism
Graduation Date: May 2008
Advisor: Dr. Mary Gruber

Humboldt State University
1 Harpst Street
Arcata, CA. 95521
B.A. in Psychology
Graduation Date: December 2006

Professional Certifications and Training

- Board Certified Behavior Analyst – Certification number: 1-09-5186
- Pro-Act 2000 Certified
- Discrete Trial Training
- California Direct Support Professional years one and two

Professional Memberships:

- Association of Behavior Analysis (ABAI)
- Utah association of Behavior Analysis (UtABA)
- California Association of Behavior Analysis (CalABA)

- Nevada Association for Behavior Analysis (NABA)

Professional Committees

- Association of Behavior Analysis International Student Representative, 2009

Teaching Experience

Spring, 2010 Utah State University

- Instructor: Distance Education Graduate course in Applied Behavior Analysis: Course was an advanced look at behavior analysis. Focus was placed on the planning, implementation and application of the concepts discussed in numerous settings.

Spring, 2009 Utah State University

- Teaching Assistant: Graduate Level course in Applied Behavior Analysis

Publications

- Betz, A.M., Higbee, T.S., **Kelley, K.N.,** Sellers, T.P. and Pollard, J.S. (2011). Increasing Response Variability of Mand Frames Through the use of Script Fading and Extinction Procedures. *Journal of Applied Behavior Analysis, 44(2),* 357-362.
- Pollard, J.S., **Kelley, K.N.,** Higbee, T.S. Comparison of Video and In Vivo Teacher Instruction on Tact Acquisition in Children with Autism (Under Review).

Research Projects

- **Kelley, K.,** *Evaluating the Effectiveness of Auditory Scripts as Compared to Textual Scripts with Children with Autism.* In progress, 2010
- Pollard, J., Higbee, T. and **Kelley, K.** *Comparison of Interactive Video Instruction and In Vivo Teacher Instruction on Acquisition and Generalization of Expressive Object Labeling in Children with Autism,* 2010
- **Kelley, K.,** Higbee, T., and Pollard, J. *Comparison of Video Instruction and In Vivo Teacher Instruction on Acquisition and Generalization of Expressive Object Labeling in New Learners with Autism*, 2011
- Sellers, T.P., Higbee, T.S., Snyder, K. and **Kelley, K.N.,** *Increasing Mand Variability in Preschoolers with Autism*. (Unpublished doctoral dissertation). Utah State University, Utah

Presentations:

- **Kelley, K.N.** *Strategies for Promoting Language* (2009). Presentation conducted at Utah State University Effective Practices Conference, Logan, UT.
- **Kelley, K.N.** *ASSERT Training in Autism, ABA and ABA Interventions and Teaching Strategies* (2009). Presentation for the Davis County School District, Farmington, UT.
- **Kelley, K.N.,** Pollard, J.S., and Higbee, T.S. (2009). *Using Activity Schedules to Promote Appropriate Independent and Interactive Play Skills for Children with Autism.* Workshop presented at the Nevada Association for Behavior Analysis Conference, Reno, NV, 2009
- **Kelley, K.N.,** Keyl, A., & Higbee, T.S. *Reduction of Problem Behavior Using a Signaled Delay to Reinforcement Procedure.* Poster presented at the Nevada Association for Behavior Analysis Conference, Reno, NV.
- Keyl, A.A., Snyder, K., Pollard, J.S., Kelley, K.N., Sellers, T.P. & Higbee, T.S. (2010). *Using Activity Schedules to Promote Appropriate Independent and Interactive Play*

Skills for children with Autism. Workshop presented at the 28th annual western regional conference of the California Association for Behavior Analysis, Burlingame, CA.

- Keyl, A.A., Kelley, K.N., Higbee, T.S. (2010). *Data Collection in the Classroom*. Workshop presented to special education teachers and paraprofessionals in Granite School District, Salt Lake City, UT.
- **Kelley, K.N.,** Austin, A. & Higbee, T.S. (2010). *Data Collection and Interpretation.* Workshop presented to the Granite school district, Salt Lake City, UT.
- **Kelley, K.N.,** Pollard, J. & Higbee, T.S. (2010). *Comparison of Interactive Video Instruction and In Vivo Teacher Instruction on Acquisition and Generalization of Expressive Object Labeling in Children with Autism.* Paper presented at the Intermountain Graduate Symposium at Utah State University, Logan, UT.
- **Kelley, K.N.** & Higbee, T.S. (2010). *Data Collection across the Instructional Day*. Presentation conducted at Utah State University Effective Practices Conference, Logan, UT.
- **Kelley, K.N.,** Snyder, K., & Higbee, T.S. (2010). *Functions of Behavior.* Guest lecture for Speech and Language Pathology students and faculty, Utah State University, Logan, UT.
- Snyder, K., **Kelley, K.N.,** & Higbee, T.S. (2010). *Using Reinforcement in Teaching.* Guest lecture for Speech and Language Pathology students and faculty, Utah State University, Logan, UT.
- Pollard, J.S., Higbee, T.S., & Kelley, K.N. (2011). *A Comparison of Interactive Video and In Vivo Teacher Instruction on Acquisition and Generalization of Expressive Object Labeling in Children with Autism.* Paper presented at the 29th annual western regional conference of the California Association for Behavior Analysis, Burlingame, CA.
- **Kelley, K.N.,** Higbee, T.S., & Pollard, J.S. (2011). *Comparison of Interactive Video and In Vivo Teacher Instruction on Acquisition and Generalization of Expressive Object Labeling in New Learners with Autism.* Paper presented at the 29th annual western regional conference of the California Association for Behavior Analysis, Burlingame, CA.
- Pollard, J.S., Higbee, T.S., & Kelley, K. (2011). *An Evaluation of Interactive Video and In Vivo Teacher Instruction on Expressive Object Labeling in Children with Autism.* Paper presented at the 37th annual conference of the Association for Behavior Analysis International, Denver, CO.
- **Kelley, K.N.,** Higbee, T.S., & Pollard, J.S. (2011, May). *Comparison of Video and Teacher Instruction on Tact Acquisition in Early Learners with Autism*. Paper presented at the 37th annual conference of the Association for Behavior Analysis International, Denver, CO.
- **Kelley, K.N.** & Higbee, T.S. (2011). *Data Collection in the Classroom: Collecting and Interpreting Data Across the Instructional Day.* Workshop presented at Utah State University Effective Practices/ Utah Association for Behavior Analysis Conference, Logan, UT.
- **Kelley, K.N.,** Pollard, J.S. & Higbee, T.S. (2011). *Comparison of Video and In Vivo Teacher Instruction on Tact Acquisition in Children with Autism.* Poster presented at the Nevada Association for Behavior Analysis Conference, Reno, NV.
- **Kelley, K.N.,** Akers, J., & Higbee, T.S. (2011). *Functions of Behavior.* Guest lecture for Speech and Language Pathology students and faculty, Utah State University, Logan, UT.

- **Kelley, K.N.,** Akers, J. & Higbee, T.S. (2011). *Using Reinforcement in Teaching.* Guest lecture for Speech and Language Pathology students and faculty, Utah State University, Logan, UT.
- **Kelley, K.N.,** Akers, J. & Higbee, T.S. (2011). *Behavioral Interventions for Students with Autism.* Presentation for Head Start teachers and paraprofessionals. Logan, UT.
- **Kelley, K.N.,** Betz, A.M., Higbee, T.S., Sellers, T.P. & Pollard, J.S. (2012). *The Application of Script Fading and Extinction Procedures to Increase Response Variability & Novel Mand Frames in Young Children with Autism.* Paper presented at the 30thannual western regional conference of the California Association for Behavior Analysis, Garden Grove, CA.

Professional Experience:

2008-2012 Utah State University ASSERT Preschool
Case Manager

- Create and manage curriculum for children with autism
- Track student progress and write progress reports
- Supervise instructors
- Conduct parent observations and trainings
- Provide Consultation services to school districts in Utah

2011-2012 Park City School District
Consultant

- Supervised the Autism Specialist
- Oversee student curriculum
- Train Autism Specialist and other school personnel on the science of Applied Behavior Analysis, Assessment Procedures, Challenging Behavior, Reinforcement Schedules and Discrete Trial Instruction

2009 – June 2010 Davis County School District
Consultant

- Train instructors, district teachers and autism specialists to provide 1:1 and classroom wide teaching strategies and behavioral intervention methodology
- Set up classroom environment and materials
- Create and manage all programming for students
- Conduct behavior assessments
- Conduct skill assessments
  - ELM
  - VB-MAPP
- Provide behavior consulting for district classrooms
- Train parents on basic principles of behavior and provide home consultation
- Monitor staff progress
- Assist in IEP goal formulation and implementation

2006-2008 Pacific Child and Family Associates
Senior Therapist

- Create and implement, life skill and academic curriculum based on clients needs and skill level

- Parent and Sibling trainings
- Staff Supervision, training, support and IOA data collection
- Discrete Trial Training (Mass trial and 1st trial)

2003-2006 Humboldt Child Care Council

- Create and implement life skill and communication programs
- Supervise staff
- Manage client programs (e.g. materials, staff questions or concerns, train staff in running of programs)
- Data collection
- Assist in writing quarterly progress reports

2004-2005 Eureka City Schools
Contracted One on One Aide/Trainer

- Develop and implement programs to support state written educational curriculum
- Train and supervise instructors
- Train parents on ABA based intervention strategies

2001-2004 Reliance House
Lead Program Counselor

- Train, observe, and supervise staff members in ABA based teaching strategies and interventions
- Train and supervise staff members on appropriate behavior management techniques
    - Including PART and Pro-ACT
- Create, train and implement all client programming
- Data collection and reporting
- Act as a liaison between doctors, Regional Center staff and administration to ensure the well being of clients