Teaching Contextually Appropriate Play Commenting Without the Use of Visual Cues

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TEACHING CONTEXTUALLY APPROPRIATE PLAY COMMENTING WITHOUT
THE USE OF VISUAL CUES

by

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ABSTRACT

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Deficits in communication and play can affect the quality of life of autistic children and individuals, which is why it is important that we help them acquire these skills as early as possible. Applied behavior analysis (ABA) and script training and fading procedures are evidence-based practices that can successfully teach communication during play. However, script fading can be difficult, and scripts may not be able to be completely faded out of the environment. The findings from a recent study suggested that script frames can become associated with visual stimuli other than that of typical scripts (e.g., picture cues). Perhaps, the visual features of the toys present during play can be these visual stimuli. If we are able to tie script frames directly to these toys using echoic prompts, then fading of supplemental visual stimuli (e.g., scripts, picture cues) would not be necessary. Thus, the purpose of this study was to investigate whether visual aids such as scripts and picture cues are necessary to teach preschool aged autistic children to make contextually appropriate play statements while playing with playsets. One participant demonstrated a small increase in their number of contextually appropriate
play statements but required the use of picture cues to meet mastery. Two participants
demonstrated no change in their number of contextually appropriate play statements until
after the picture cues were introduced. Those two participants also required the addition
of pre-session behavioral skills training to meet mastery. Additionally, all three
participants generalized their responding to novel playsets. We also discuss potential
limitations and suggestions for future research.
Deficits in communication and play can affect the quality of life of autistic children and individuals, which is why it is important that we help them acquire these skills as early as possible. Applied behavior analysis (ABA) and script training and fading procedures are evidence-based practices that can successfully teach communication during play. However, script fading can be difficult, and scripts may not be able to be completely faded out of the environment. The findings from a recent study suggested that specific phrases can become associated with small pictures rather than written scripts. Perhaps, these specific phrases can be tied directly to the toys being played with using verbal prompts. If this is possible, the fading of supplemental visual aids (e.g., written scripts, small picture) would not be necessary. Thus, the purpose of this study was to investigate whether visual aids such as written scripts and small pictures are necessary to teach preschool aged autistic children to make play statements while playing with playsets. One participant demonstrated a small increase in their number of play statements but required the use of small pictures attached to the toys to meet mastery. Two participants demonstrated no change in their number of play statements until after the small pictures were introduced. Those two participants also required the addition of pre-session teaching to meet mastery. Additionally, all three participants continued making play statements
with new playsets. We also discuss potential limitations and suggestions for future research.
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CHAPTER I
INTRODUCTION

Autism spectrum disorder’s (ASD) prevalence among children continues to grow, from one in 150 in 2000 to one in 36 in 2020 (Centers for Disease Control and Prevention [CDC], 2023). According to the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5), autistic individuals are characterized by deficits in social communication and interaction as well as restrictive and/or repetitive behaviors (American Psychiatric Association [APA], 2013). Social communication and interaction deficits may be related to initiations and responses with others, body language, engaging in various types of play, etc. A deficit in initiations and responses may appear as an autistic individual not responding to a peer when they make a comment about what they are playing with or not going up to a peer and asking them to play. Not being able to recognize when someone is bored can be a deficit related to interpreting body language. Deficits in play may look like the autistic individual playing alone or not engaging with any peers nearby. These deficits can affect the quality of life of autistic children and individuals, which is why it is important that we help them acquire these skills as early as possible (Akers et al., 2016).

One way we can teach play and communication skills to young children with ASD is by using intervention techniques based on the principles of applied behavior analysis (ABA). Interventions based on ABA principles have been effective for teaching new skills to autistic individuals, including teaching play and communication skills (Brunner & Seung, 2009). For example, Shabani et al. (2002) taught three children with
autism verbal initiations using a tactile prompt. The tactile prompt consisted of a small vibrating pager that could be concealed within a pocket. Following baseline, Shabani et al. taught participants how to make three different verbal initiations when the pager vibrated using verbal models and positive reinforcement. After training, sessions were conducted with peers and the only prompt provided was the tactile prompt. If the participant did not respond to the initial tactile prompt, it was presented again, need for the second prompt varied across participants with some participants requiring it more than others. All three participants emitted more verbal initiations in the presence of the tactile prompt and effects were replicated in a return to baseline and reintroduction of the prompt for two participants. One participant required retraining; however, the initial increase in verbal initiations was not recaptured. Interestingly, all three participants also showed an increase in verbal responses to peers, though that response was not specifically targeted by the intervention. Shabani et al. also attempted to fade the frequency of the tactile prompt for two participants, with varying success. The frequency of the tactile prompt was reduced by 10-30% for one participant and only 5% for the other.

In another example, Nikopoulos and Keenan (2004) taught three autistic children social initiations and reciprocal play using video modeling. Social initiations consisted of vocal or gestural requests to play, while reciprocal play consisted of playing with the toy with the experimenter. The video model depicted a peer correctly demonstrating the social initiation then playing with the experimenter. For two participants, the video model needed to be simplified to only show the social initiation. All three participants acquired
the social initiations and increased their reciprocal play. Further, social initiations
generalized to toys not depicted in the video model and maintained at 1- and 3-month
follow-ups. Interestingly, the follow-up sessions did not include the presentation of the
video model, though the video model was never faded.

The studies by Shabani et al. (2002) and Nikopoulos and Keenan (2004) highlight
two different ABA methods of increasing communication and play. One commonality
between the two studies is that both treatments included some sort of model for the
desired verbal response. Shabani et al. used an in-vivo verbal model during the initial
training with the tactile prompt. While Nikopoulos and Keenan included a verbal model
in their video model, with their simplified video model only containing the verbal model.
However, neither study presented any in-vivo verbal models or additional prompts
(besides the tactile prompt; Shabani et al., 2002). Additionally prompting during sessions,
may have been beneficial for Shabani et al.’s participant that required retraining.
Specifically, the inclusions of a verbal model, similar to some of those use in script
training and fading, may have been able to help that participant recapture their previous
performance.

**Script Training and Fading**

Script training and fading is an evidence-based practice based on the principles of
ABA that involves teaching communication using scripts and prompting (Akers et al.,
2016). Script training and fading packages often consist of the following components a)
pre-teaching the use of scripts and auditory script devices, b) scripts embedded into the
environments, c) dynamic manual prompting to attend to or interact with the script, d) echoic prompts to follow (vocalize) the script, and e) fading of the script (Table 1).

Scripts are presented as either a visual (e.g., traditional textual script) or auditory stimulus to evoke a desired communicative response (Akers et al., 2016). When using a visual script, the desired communicative response is often presented in textual form that has point-to-point correspondence with the desired vocal response. For example, Wichnick-Gillis et al. (2019) attached scripts for five different initiations to materials related to an activity and then manually prompted the participants to use the script. Wichnick-Gillis et al. faded scripts back-to-front by removing the last word from the script until all of the words were gone across all of the scripts. Interestingly, Wichnick-Gillis et al. did not need to use any vocal prompting when training the script. Vocal prompting in the form of an echoic prompt is often used to evoke the desired vocal response when prompting the individual to point or touch the script is not enough. However, sometimes vocal prompts are incorporated into the script training and fading procedure through the use of auditory scripts.

When using an auditory script, a device is present which, when activated, plays the desired scripted response. These auditory script devices are often activated by the individual using the script. For example, Reagon and Higbee (2009) used an auditory script device that, when activated, played the desired scripted response. Reagon and Higbee used pre-teaching to teach participants how to independently activate the auditory script devices and respond to the auditory script. Auditory script devices were then placed near toy sets and participants were manually prompted to activate them. The auditory
scripts were faded out back-to-front by rerecording the auditory script and leaving out the last word until all of the words were gone. One participant, Brandon, had difficulties during the script fading procedure. During the final step of script fading, when the auditory script device made no sound, he would say that it was broken and stopped initiating. Reagon and Higbee decided to completely remove the auditory script device rather than attempting to fade the auditory scripts again. Further, they discussed that all three participants continued to engage with the auditory script device despite it no longer playing the script and hypothesized that the device may have been acting as a discriminative stimulus to engage in the social initiations. This suggests that the auditory script device itself may have been acting as a visual support for engaging in social initiations, not just as a method for delivering the script.

While script training and fading is an effective method to promote communication, the presence of the scripts may draw unwanted attention to the individual using them and may be stigmatizing. While visual scripts can be reduced in size and made less salient in the environment, auditory scripts cannot. Further, considering the importance of early intervention, many individuals for whom script training and fading would be beneficial may lack the prerequisite reading skills required to use textual scripts effectively. Considering these limitations, a recent study by Mattson et al. (in press) investigated whether visual picture cues could be used in lieu of textual scripts using script training and fading procedures.

Mattson et al. (in press) found that all three preschool-aged autistic children increased the number of contextually appropriate play statements during play sessions
demonstrating that picture cues with no text could effectively act as a visual script. While traditional scripts have point-to-point correspondence with the desired vocal response, Mattson et al.’s generic picture cues did not. Textual scripts clearly evoke textual behavior, while auditory scripts evoke echoic behavior. However, the type of verbal behavior evoked by the picture cues is less clear. It is possible that the picture cues may have acted as either a non-verbal stimulus evoking a tacting, or labeling, response or as a verbal stimulus evoking an intraverbal response. Further analysis and research are needed to explore the role that the picture cue plays in evoking individuals verbal behavior. However, none of Mattson et al.’s participants maintained responding when the cue was removed and fading of the cue was not attempted.

**Table 1**

*Components of Script Training and Fading*

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
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<tbody>
<tr>
<td>Script</td>
<td>Textual- Written point-to-point correspondence with the desired vocal response</td>
</tr>
<tr>
<td></td>
<td>Auditory- Vocal model with point-to-point correspondence with the desired vocal response</td>
</tr>
<tr>
<td>Pre-teaching</td>
<td>Teaching the student how to use the scripts</td>
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<tr>
<td></td>
<td>Textual- Point to and say the word on the script</td>
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<tr>
<td></td>
<td>Auditory- Activate the auditory script device and repeat the phase</td>
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<tr>
<td>Embedment of scripts</td>
<td>Attaching the script directly to objects/items or near them</td>
</tr>
<tr>
<td>Dynamic prompting</td>
<td>Only providing prompts when needed</td>
</tr>
<tr>
<td></td>
<td>Physical (attending prompt)- Manually guiding the student to interact with the script</td>
</tr>
<tr>
<td></td>
<td>Verbal (echoic prompt)- Providing a vocal model of the desired response</td>
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</tbody>
</table>
Fading

Gradual removal of the script. Often accomplished by removing the last word until all the words are gone

Script fading can be difficult, and the script may not be able to be completely faded out for all individuals (Akers et al., 2016). This may be due to the faded scripts acting as visual support in the form of discriminative stimuli. While initially the script acted as a response prompt to evoke the desired communicative response, the presence of the faded script (e.g., blank paper for textual scripts or auditory script device) may later act as a discriminative stimulus that indicates reinforcement for a specific behavior, in this case communicative responses (Reagon & Higbee, 2009). Unfortunately, the remaining aspect of the script may still be stigmatizing which could counteract long term treatment effects.

These visual and auditory scripts are only one component of the script training and fading treatment package which also include manual prompting, graduated guidance, echoic prompts, etc. (See Table 1). Given the varying levels of success in fading scripts completely out, perhaps these tangible visual and auditory scripts are not a necessary component. In a study by Howlett et al. (2011), researchers presented the auditory script behind the participant where it could not be seen. Howlett et al. taught two participants to mand for information regarding the location of a toy using script training and fading procedures. Both participants acquired the mand. One participant required script fading, while the other participant did not. Considering the auditory prompt device was never manipulated by Howlett et al.’s participants, the auditory script functioned similarly to an echoic prompt, without the additional visual support of the auditory device’s presence.
Thus, it is possible that script training and fading procedures could be adapted to use echoic prompts rather than auditory devises removing the need to fade the device from the environment.

In summary, script training and fading treatment packages appear to be an effective method of teaching communication to individuals on the autism spectrum. However, the presence of the visual or auditory script may be stigmatizing for the individuals using them. Additionally, completely fading scripts is not always easy, and some aspect of the script may sometimes remain in the environment. Using echoic prompts instead of tangible scripts may be a possible alternative. Thus, a review of the literature is needed to determine how to best adapt the script training and fading treatment package for the use of echoic prompts in lieu of visual or auditory scripts.
CHAPTEII
LITERATURE REVIEW

I conducted a review of the literature related to script training and fading using PsycINFO via EBSCOhost. I used the following search terms: “script training” OR “script fading” OR “social script” OR “visual script.” I then narrowed down the search results to only include articles that were peer reviewed and published in English, yielding 100 articles. I removed three duplicate articles, leaving 97 articles to be screened for inclusion. In order to be included, each article had to a) be a peer-reviewed, b) measure a dependent variable consistently over time, c) include textual or auditory script training, and (d) include child participants between the ages of 2-12. After screening the title and abstract of the 97 articles, I eliminated an additional 58 articles. I then screened the methods section of the remaining 39, eliminating another 20 articles. Additionally, a recent study by Mattson et al. (in press) was also included. Thus, I reviewed the script training and fading procedures of 20 articles.

I will start by reviewing the seminal studies by Krantz and McClannahan (1993, 1998). Then I will review studies based on the skills that were taught. First, I will review studies that taught manding skills. Next, I will review studies that taught bids for joint attentions. Lastly, I will review studies teaching initiation, responses, interactions, and commenting. Finally, I will discuss the script training and fading literature as a whole and present the purpose of the current study and my research questions.

Seminal Studies
In the seminal study on script training and fading, Krantz and McClannahan (1993) taught four autistic children to initiate and respond to peers during an art activity at a school and research center for children with autism. During baseline, researchers placed written instructions to do art and talk at each participant’s place. During training, researchers added scripts for ten statements or questions below the instructions. If participants did not make an initiation, the teacher manually prompted them to point to the statement or question with their pencil and drag the pencil along the script. Krantz and McClannahan faded prompts back-to-front in five steps until only one quotation mark remained. Krantz and McClannahan used a multiple baseline design across participants to evaluate the effects of the intervention on participants’ initiations and responses to peers. For three of the four participants, initiations only increased compared to baseline after scripts were implemented. While data for the fourth participant showed an increase in initiations following scripts being implemented with the first participant. Krantz and McClannahan noted that these “initiations” were related to not wanting to interact with peers. Krantz and McClannahan observed maintenance and generalization to a different teacher and activity for all four participants with the faded scripts present.

Krantz and McClannahan (1998) extended their previous study (Krantz & McClannahan, 1993) by teaching three younger autistic children to make interactions with a familiar adult (e.g., teacher) while completing a picture activity schedule in a classroom at their school. During all research sessions, the interaction recipient responded to participant interactions by making a comment related to what the participant was doing. During baseline, a second teacher prompted the activity schedule steps and no
scripts were present. During teaching, the scripts were incorporated within the activity schedule either above or below the picture of the activity. The second teacher manually prompted the participant to point to the script and, if the participant did not say the phrase, provided an echoic prompt. Then, the second teacher manually prompted them to walk to the interaction recipient. If the participant did not say the interaction, the second teacher prompted them back to the activity schedule and began the prompting process again. A modification was made for one participant, in which Krantz and McClannahan made the script removable from the activity schedule and attachable to a Velcro bracelet. Again, script fading was conducted back-to-front, this time by removing a third of the script until it was completely gone. Krantz and McClannahan used a multiple baseline design across participants to evaluate the effect of the intervention on the participant’s interactions (e.g., initial comment) and elaborations (e.g., responses to comments made by the interaction recipient) with a familiar teacher. They found that following the implementation of treatment, all three participant’s interactions and elaborations increased compared to baseline. Additionally, participant responding generalized to a new interaction recipient and new activities.

Krantz and McClannahan’s (1993, 1998) studies on script training and fading procedures paved the way for a robust literature base for teaching many types of communication using scripts. While both of their studies used visual scripts, future researchers would extend visual scripts to auditory scripts as they struggled to promote language with pre-readers.

Manding
Scripts have been used to teach children manding (e.g., requesting). One of the most common forms of manding taught are mands for snacks. Further, researchers have shown interest in promoting varied over rote responding and have investigated treatments to promote varied responding. For example, Betz et al. (2011) taught three preschool-aged children with autism spectrum disorder (ASD) to mand for different snacks using three different mand frames and assessed the number of novel mand frames that occurred. During baseline, any mand frame was reinforced with access to the desired snack item. During extinction phases, only novel mand frames (e.g., the first occurrence of a mand frame) were reinforced. During script training and fading, an auditory script device associated with one mand frame (indicated by a colored sticker) was present, and researchers only reinforced that mand frame. If the participant did not emit the target mand every 30 seconds, the researcher manually prompted them to activate the auditory script device. Mand script frames were taught sequentially, and scripts were faded out back-to-front, removing one word at a time until only the colored sticker was present. Betz et al. (2011) used an ABAB design to evaluate the effects of the treatment on the number of novel mand frames. Two participants showed an increase in novel mand frames during extinction phases after being taught all three mand frame scripts separately. These two participants also generalized this responding to a new setting and maintained responding in the absence of the colored stickers. One participant, Drew, required modified procedures in which researchers implemented a simultaneous mand frame training condition in which all three mand frames were taught and reinforced simultaneously. This resulted in an increase in
mand frame variability for Drew and he generalized this responding to a new setting and maintained responding after two weeks.

Sellers et al. (2016) extended research by Betz et al. (2011) by teaching six children with ASD to mand for items during snack at a university-based preschool for children with ASD by teaching scripted mand frames simultaneously rather than sequentially. During baseline, scripts were not present, and researchers reinforced all mand frames with access to the requested item. During script training, researchers taught participants three mand frames by either sequentially or concurrently presenting the scripts. For participants who were presented scripts sequentially, researchers presented scripts one at a time in a random order. For participants who were presented scripts concurrently, all three scripts were present throughout training sessions. If participants did not independently mand for an item within 5s or used the same mand frame two times in a row, researchers prompted them first by manually guiding them to touch the script and then by adding an echoic prompt if needed. Sellers et al. faded scripts back-to-front until either only the first word remained or the script was completely removed. During the extinction for repeated mand frames condition, no scripts were present, and researchers only provided reinforcement the first time a mand frame occurred. During the FR1 condition, researchers reinforced all mand frames with access to the requested item. Sellers et al. used a nonconcurrent multiple baseline design to evaluate the effects of the treatment on participant’s mand frame variability. Two participants engaged in varied manding during the FR1 condition, indicating that use of the different mand frames persisted even when variability was not required to produce reinforcement. Three
participants only continued engaging in varied manding during the extinction for repeated mand frames condition. The remaining participant only engaged in varied manding during two sessions of their last FR1 condition, otherwise, varied manding only occurred during training sessions. The idiosyncratic results from this study highlight how treatments can differentially affect individuals.

In another study investigating varied manding, Brodhead et al. (2016) taught three children with ASD to use different mand frames to request snacks at a university-based early intensive behavioral program. Researchers conducted baseline sessions with a white placemat in which no scripts were present and all mands were reinforced with access to the desired snack item. Additionally, researchers ran three baseline probe sessions with the three other placemats 1) participant’s typical placemat (color varied across participants), 2) red, and 3) green. Researchers also conducted baseline extinction of repetition sessions in which placemats were white and they only reinforced the first time a specific mand frame was used. Script training consisted of two types of sessions. During vary sessions, placemats were green with four to five scripts attached to it and mands were reinforced using either a lag schedule. During no vary sessions, placemats were red and had the same scripts attached to them. However, researchers only reinforced the use of one mand frame (e.g., “I want ___”). If participants did not engage in a mand frame after 15s or their responding did not match the schedule for that type of session, researchers manually prompted them to use one of the scripts on their placemat and provided an echoic prompt if needed. One participant, Gus, required modifications during script training. Initially, researchers prompted the first three responses of each session,
then they rotated between the placemats every 75s and continuously prompted the participant. All scripts were faded back-to-front by removing the last word until the script was completely removed. Brodhead et al. used a nonconcurrent multiple baseline design across participants with an embedded multielement design to evaluate the effects of the treatment on the variability of mand frames. They found that two participants only engaged in varied mand frames during the vary sessions, indicating that responding was able to come under control of the placemat color. The third participant eventually demonstrated differential responding after training modifications were implemented. Additionally, all three participants generalized their responding to a new setting and maintained at the 2-week follow-up session.

In a different type of manding study, Howlett et al. (2011) taught two children with expressive language delays to mand for information about a toy’s location at their school. Each session contained five establishing operation (EO; the toy was missing) trials and five abolishing operation (AO; the toy was present) trials. For all AO sessions, the participant removed the toy and played with it for a few minutes before researchers presented the next trial. For EO baseline sessions, if the participant did not mand for information, researchers presented a mastered instruction and then conducted the next trial. During EO script training sessions, if the participant did not mand within 5 seconds of opening the container, researchers prompted the response by playing the audio script device behind, out of sight of the participant. Howlett et al. reinforced both prompted and independent mands by providing the location of the item and allowing the participant to play with the toy. For the participant that required script fading, the script was faded
back-to-front by removing the last word until all the words were gone. Howlett et al. used a multiple probe design across participants to evaluate the effects of the intervention on mands for information. After the treatment was introduced, both participants demonstrated increased mands for information compared to baseline. Additionally, both participants demonstrated generalization to a novel instructor, novel toys, and novel settings and maintained their responding during follow-up sessions. One limitation of this study is that Nick manded for toys in three AO sessions, when the toys were in the container. While this only occurred for a few sessions and decreased back to zero, this indicates that there may have been some stimulus control issues related to when to mand for information.

Researchers have effectively used script training and fading treatment packages using visual and auditory scripts to promote varied manding as well as teach manding for information. These studies focused on teaching manding for tangible items (e.g., edible snacks, toys). However, people sometimes also mand for attention, which we often refer to as bids for joint attention.

**Bids for Joint Attention**

Bids for joint attention have also been taught using scripts. Bids for joint attention involve an individual having someone else attend to their behavior or something they see. For example, MacDuff et al. (2007) taught three autistic children to make bids for joint attention at the Princeton Child Development Institute. They conducted all baseline and training sessions in two hallways with various two- and three-dimensional stimuli placed
along the hallways. Throughout the study, instructors followed all bids for joint attention by a brief comment relating to the stimulus. During baseline sessions, instructors walked along each hallway with participants providing tokens for appropriate walking and no scripts were present. During training, auditory script devices with single word scripts were placed on all two- and three-dimensional stimuli placed along the hallways. If the participant attempted to pass the stimulus without making a bid for joint attention the instructor manually prompted them to activate the auditory script device. Instructors provided tokens for prompted bids and edible reinforcers for independent bids. MacDuff et al. faded auditory scripts in two steps 1) erasing the script, only the device was present, and 2) removing the device and edible reinforcement. MacDuff et al. used a multiple probe design across participants to examine the effects of the treatment on the number of bids for joint attention made by participants. All three participants emitted more bids for joint attention following the introduction of the auditory scripts compared to baseline. Additionally, responding generalized to novel settings and novel stimuli and responding maintained.

In an extension of MacDuff et al. (2007), Pollard et al. (2012) taught three autistic children to make bids for joint attention at a university-based preschool. Similarly, Pollard et al. conducted research sessions in a hallway containing ten two- and three-dimensional stimuli placed throughout. During sessions, participants walked down the hallway with an adult and the adult responded to any verbalization with a generic comment. During baseline, scripts were not present. During training, textual scripts were attached to all two- and three-dimensional training stimuli placed in the hallway. Adults
manually prompted participants to orient towards the two- or three-dimensional stimuli, point to the attached script, and then orient to the adult using most-to-least prompting and used a 2s prompt delay for echoic prompts. Two participants required an error correction procedure where the adult prompted participants to start the bid for joint attention over. Pollard et al. faded scripts back-to-front by removing the last word from the script until the whole script was gone. Following training, researchers conduct an adult scripted responses condition in which adult no longer responded with general statement, instead responding with a statement related to the feature, function, or class of the stimulus. Next, researchers implemented multiple-script training in which eight to ten new scripts were introduced simultaneously. Pollard et al. used a multiple baseline across participants to examine the effects of the various conditions on participant’s bids for joint attention. They found that the initial script training increased all three participant’s bids for joint attention compared to baseline and responding generalized to novel stimuli and people. However, only one participant, Drew, responded with unscripted bids after the scripts were completely faded out. While the other two participants unscripted bids only increased during the adult scripted responses and multiple-scripts conditions.

In a more recent study, Gomes et al. (2020) taught four autistic children to make bids for joint attention in a variety of locations (e.g., hallways, classrooms) at a private school for children with autism using auditory scripts. During all sessions, social partners responded to bids for joint attention with comments. During baseline, no scripts or manual guidance were use. During script training if the participant did not make a bid for joint attention within 5 seconds, researchers manually guided the participant to a)
point/orientate to the stimulus, b) orientate to the social partner, and c) orientate back to the stimulus. The auditory script was played behind, out of view of the participant to prompt the participant’s vocal response. The social partner delivered edible reinforcement for two participants. Gomes et al. faded scripts back-to-front by removing the last word until the auditory script device was no longer activated. Gomes et al. used a multiple baseline design across participants to examine the effects of the intervention on bids for joint attention. They found that bids for joint attention increased compared to baseline for all four participants and maintained during follow-up sessions. Additionally, all four participants demonstrated some generalization to novel stimuli and a natural setting. While script frames were not used in this study, Gomes et al. noted that the participants generally started their vocal responses using similar phrases indicating that script frames may be useful in teaching bids for joint attention.

Using scripts to teach bids for joint attention began with Krantz and McClannahan’s (1998) second study and researchers continued to investigate this topic with success. While Krantz and McClannahan’s initial study taught bids within the context of play later researchers moved away this, though some still used toys as stimuli. Perhaps this was due to the expansive literature on teaching initiations, responses, interactions, and commenting using scripts that was developing at the same time.

**Initiations, Responses, Interactions, and Commenting**

Krantz and McClannahan’s (1993) seminal study focused on increasing initiations and responses. Teaching these skills continued to be a focus for future researchers.
Within the literature on script training and fading many of the studies focused on these skills, or skills similar to them such as interactions and commenting. Initiations, interactions, and commenting are all defined within the literature similarly in that they are generally the initial verbal behavior for a potential social interaction. Conversely, responses are the verbal behavior that follows initiations, interactions, and comments.

In an extension of Krantz and McClannahan’s (1993, 1998) previous studies, Sarokoff et al. (2001) taught two children with ASD to make comments related to specific stimuli with a peer at a day education and treatment center for children with ASD. All stimuli used in the study contained naturally embedded text of the name of the item on its packaging. During baseline, no scripts were present. During training, textual scripts were presented to the participants and researchers prompted participants to attend to the script with a gestural prompt. Sarokoff et al. faded scripts back-to-front by first removing the last 25% of the script, then the last 50%, then only the first letter, then the blank paper and, finally, the paper was removed. Sarokoff et al. used a multiple baseline design across stimuli to evaluate the effects of the intervention on participant’s comments related to that stimulus. They found that both participants engaged in more comments after the introduction of the textual scripts compared to baseline and that unscripted comments generalized to novel stimuli and peers. Interestingly, Sarokoff et al. reported that unscripted comments did not occur during the follow-up sessions. They hypothesized that this may have been due to the lack of presence of the researcher and/or instructions, potentially indicating faulty stimulus control over unscripted responses.
Reagon and Higbee (2009) taught three children with ASD to make initiation during play with their parents in the home. During baseline, no auditory script devices were present, and parents played with their child and responded to any verbal responses made by the participant. During training, the auditory script devices were placed near or on relevant parts of the toy set. If participants did not activate an auditory script device, parents manually prompted them to activate it and responded to the initiations with pre-scripted responses. Auditory scripts were faded back-to-front by removing the last word of the script until all of the words were gone and only the device was present. Reagon and Higbee conducted follow-up sessions two weeks following training. During follow-up sessions, parents implemented baseline procedures. Additionally, Reagon and Higbee conducted generalization sessions with two other toy sets throughout the entire study. Auditory scripts were never present during generalization sessions.

Reagon and Higbee used a multiple baseline design across participants to evaluate the effects of the intervention on participant’s initiations. All three participants engaged in more initiations after the implementation of script training and fading compared to baseline and generalized responding to novel toy sets. Only two participants maintained initiations during follow-up sessions. For the other participant, Collin, researchers introduced new toys and previous levels of initiations were recaptured and maintained at a second follow-up session. Reagon and Higbee hypothesized that Collin’s decreased responding may have been due to satiation.

In an extension of Regan and Higbee (2009), Akers et al. (2018) taught three autistic children to make contextually appropriate play statements with their siblings.
while playing in their homes. Throughout all sessions siblings responded to all comments made by the participant by commenting on their own play behavior. During baseline, participants played with the target toy set. During treatment, the sibling presented one of three auditory scripts to the participant every 30 seconds by placing the auditory script device in sight of the participant. If the participant did not engage with the device, the sibling manually prompted them to activate the auditory script and then provided an echoic prompt, if needed. Scripts were faded back-to-front by removing the last word of the scripts until the entire device was no longer present. Akers et al. used an adapted alternating treatments design embedded into a multiple baseline design across participant to evaluate the effects of their intervention on the participant’s contextually appropriate statements. They found that all three participants increased their contextually appropriate statements compared to baseline and that this increase generalized to two generalization toy sets. Additionally, levels of responding maintained during follow-up sessions for all three participants. While Akers et al. observed an increase in contextually appropriate play statements, the novelty of these statements was not assessed. Thus, it is unknown whether participants primarily used the statements taught to them or if the blended statements or came up with new ones.

In a series of two studies Wichnick et al. (2010a, 2010b) taught three participants to first make initiations with peers and then to make responses to initiations made by peers. While both studies used the same three participants, the study teaching initiations occurred before the study teaching responses started. For both studies, research sessions took place at a table where all three participants sat together while completing a written
activity schedule with bins holding Ziploc bags containing items to share next to them. During baseline, no auditory script devices were present. During teaching, researchers added auditory script devices to bags containing toys. Initially, Wichnick et al. (2010a) immediately manually prompted participants to activate the auditory script device and make the initiation before handing the second toy to a peer. During Wichnick et al. (2010b), peers handed the bag containing both the toy and auditory script device to the peer after making the initiation and then researchers immediately manually prompted participants to activate the auditory script device. During both studies, if the participant did not respond to the first prompt, the manual prompt was repeated. Scripts were faded back-to-front by removing the last word of the script until all of the words were gone and the device was removed. Wichnick et al. (2010a) used a multiple baseline design across participants to evaluate the effects of the intervention on participant initiations. They found that all participants engaged in more initiations following the introduction of scripts compared to baseline and generalized initiations to novel toys. Wichnick et al. (2010b) also used a multiple baseline design across participants to evaluate the effects of the intervention on participant responses. They found that all participants engaged in more responses to peers after the scripts were introduced. Interestingly, across both studies, two of the participants, Ian and Aaron, engaged in a few of the targeted verbal behavior during baseline. Some of these instances occurred before treatment was introduced for any of the participants, so it is difficult to hypothesize why the verbal behavior occurred.
Garcia-Albea et al. (2014) taught four autistic children vocal interactions during play at a private school for children with autism using auditory scripts attached to different toys. Vocal interactions included both initiations and elaborations (e.g., responding to the play partner’s comment). During baseline, the play partner responded to any vocal interaction, but no scripts, prompting, or edible reinforcement was present. During script training and fading, scripts were attached to the training toys and researchers prompted the participant to activate the auditory script device using manual guidance if the participant did not make a vocal interaction within 10 seconds. The play partner responded to all vocal interactions with the training toys by replying with a statement and providing an edible reinforcer. Auditory scripts were faded back-to-front by first removing the last word, until the entire device was removed. One participant required modified fading procedures which included playing the auditory script behind, out of sight of the participant. Garcia-Albea et al. used a concurrent multiple probe design across participants to evaluate the effects of the intervention on the number and type of interactions during sessions. They found initiations increased for all four participants compared to baseline and that responding generalized to novel toys. Three of the four participant’s responding maintained during follow-up sessions. While no vocal prompts were provided during this study, the modification of the fading procedure for Adam where the auditory device was activated behind the participant by a researcher is similar to that of an echoic prompt.

In a study teaching commenting, Groskreutz et al. (2015) taught three preschool-aged children with ASD to make comments while playing in a special education
classroom at a public school. Throughout all sessions, the researcher replied to comments made by the participant by making a comment themselves. During baseline, no scripts were present, and the researcher played with a toy and made a comment every 30s if no comments were being made by the participant. During script training, script frames were attached to various parts of the toy. If the participant did not make any play comments, the researcher prompted them to point to the script frame using least-to-most physical prompting. Groskreutz et al. conducted commenting probes in which no scripts were present every few sessions using toy sets and activities. Researchers faded scripts back-to-front by removing a percentage of the end until only 13% of the script remained for one participant and a piece of tape for the other. Groskreutz et al. used a multiple probe design across participants to examine the effects of the intervention on play commenting during commenting probes. All three participants demonstrated higher levels of commenting during commenting probes compared to baseline. Additionally, commenting generalized to novel toy sets for all participants as well as an art activity for one participant.

In a study focused on initiations and responses, Ledbetter-Cho et al. (2015) taught three autistic children to share toys and initiate with peers at a university-based clinic. Researchers provided praise for any initiations and responses made by participants throughout all conditions. During baseline, no scripts were present. During script training, researchers presented textual scripts in front of the participant after giving the instruction to share. If the participant tried to share a toy without say the initiation, the researcher provided a verbal prompt to read the card and placed the toy back in front of
the participant. Scripts were faded back-to-front by removing the last word of the script and then the last word of the letter, one at a time until only the blank card remained. Then the blank card was removed and researchers used their open hand in place of the card and provided a verbal prompt. Ledbetter-Cho et al. used a multiple baseline design across participants to evaluate the effects of the intervention on initiations and responses to peers. Script training and fading was effective at increasing participants initiations and responses for all participants. Additionally, all participants maintained responding during the follow-up sessions and showed some generalization to novel toys, setting, and peers. While Ledbetter-Cho et al. were able to completely fade scripts the procedure had a lot of steps which may have been time consuming and could lead to implementation errors.

Wichnick-Gillis et al. (2016) taught three autistic children to engage in interactions with peers while engaging in leisure activities. During baseline, no scripts were present, and the instructor did not provide any prompts. During teaching, textual scripts were attached to five of the seven leisure activity materials, the remaining two leisure activity materials were used to assess generalization. Instructors manually prompted participants to point to the scripts, read the scripts, and orient towards a peer. If the initial prompt was not successful, instructors repeated the manual prompting and then added a verbal prompt. Instructors reinforced two participants’ interactions with tokens or verbal and social praise. Wichnick-Gillis et al. faded scripts back to front by removing the last word of the script until all of the words were gone. Wichnick-Gillis et al. used a multiple baseline design across participant to examine the effects of the intervention on participant’s interactions with peers. All three participants engaged in higher levels of
interactions after the introduction of the scripts compared to baseline. However, two of the participants did engage in interactions during baseline. Interestingly, the participants in this study shared the same names as two previous script training and fading studies (Wichnick et al., 2010a; Wichnick et al., 2010b). Further the participants who engaged in some interactions during baseline in this study were named the same as the two participants who engaged in some initiations during baseline in a previous study (Wichnick et al., 2010a). It is possible that the participants in this study were the same as the previous study, and the use of scripts generalized to interactions.

In a more recent study by Wichnick-Gillis et al. (2019), they taught three children with ASD to make initiations during activities with peers and then assessed if responding would generalize in the home with siblings. Instructors delivered reinforcement in the form of check marks and verbal and social praise for all contextually appropriate initiations, except during generalization sessions. During baseline, no scripts were present. During training, textual scripts were attached to the activity materials and instructors manually prompted participants to point to and read the scripts. If the participant did not respond to the prompt the manual prompting was repeated. Scripts were faded back-to-front by removing the last word until all of the words were gone. Wichnick-Gillis et al. used a multiple baseline design across activities to evaluate the effects of the treatment on initiations with peers and siblings for all three participants. All three participants initiations increased with both peers and siblings compared to baseline. While effects generalized to siblings in the home, Wichnick-Gillis et al. discussed that a researcher who was present throughout every session may have developed some stimulus
control over initiations. This is somewhat similar to Sarokoff et al. (2001) who found that unscripted comments decreased when the presence of the researcher was removed. Thus, it appears that it may be possible for stimulus control to transfer to implementers rather than the natural stimuli.

Finally, in a recent study, Mattson et al. (in press) taught three preschool-aged children with ASD to make contextually appropriate play statements at a university-based preschool for children with ASD. Instead of traditional textual scripts, Mattson et al. used picture cues on different colored backgrounds that were tied to three different script frames. Throughout all sessions, the play partner responded to participant’s contextually appropriate play statements with comment related to the participant’s statement. During baseline, three picture cues (i.e., one for each script frame) were attached to the play set, but researchers did not provide any prompts. During script training, participants were manually prompted to touch the picture cue and were provided an echoic prompt of a contextually appropriate play statement using the script frame tied to that picture cue. Scripts were faded using a progressive time delay prompt for echoic prompts, in which the time between prompting pointing to the picture cue and the delivery of an echoic prompt progressively increased until the delay was 6s. Researchers delivered manual prompts every 30s during training sessions. Following script training, researchers removed the picture cues from the training play sets to observe if responding would persist in the absence of the picture cues. However, the picture cues were reintroduced for all three participants. Researchers conducted follow-up sessions 1- and 2-weeks following training for two participants and 3-weeks following training for one participant.
Follow-up sessions followed the same procedures as sessions using the last progressive
time delay (6s) prompting. Additionally, Mattson et al. conducted generalization probes
to novel play sets prior to and following training. Generalization probes prior to training
used baseline procedures, while generalization probes following training used the final
progressive time delay (6s) procedures.

Mattson et al. (in press) used a nonconcurrent multiple baseline design across
participants with embedded reversal components to evaluate the effects of the
intervention on contextually appropriate play statements. They found that all three
participants made more contextually appropriate play statements during training
compared to baseline. When researchers removed picture cues, participant responding
decreased. Once picture cues were reintroduced, responding returned to training levels.
During follow-up sessions, one participant maintained their previous level of responding,
one participant initially maintained their level of responding than decreased, and one
participant’s responding decreased. Additionally, all three participants generalized
contextually appropriate play statements to the novel play sets. Unfortunately, Mattson et
al. did not attempt to fade the picture cues so it is unknown if fading them would have
been successful.

The script training and fading literature on initiations, responses, interactions, and
commenting is extensive. All of these studies taught the vocal responses within the
context of play, highlighting the importance of play in the development of language.
Additionally, the most recent study conducted by Mattson et al. (in press), began to
investigate the relationship between visual stimuli, typically textual or auditory script devices in the past, and participant’s responding.

**Summary**

Overall, the literature on script training and fading indicates that both visual (Brodhead et al., 2016; Krantz & McClannahan, 1993; Ledbetter-Cho et al., 2015; Mattson et al., in press) and auditory (Betz et al. 2011; MacDuff et al., 2007; Wichnick et al., 2010a; Wichnick et al., 2010b) scripts are effective at teaching language. Script training and fading treatment packages using visual and auditory scripts can effectively teach manding (Howlett et al., 2011; Sellers et al., 2016), bids for joint attention (Gomes et al., 2020; Krantz & McClannahan, 1998), initiation and responses (Krantz & McClannahan, 1993; Reagon & Higbee, 2009), interactions (Garcia-Albea et al., 2014; Wichnick-Gillis et al., 2019) and commenting (Akers et al., 2018; Mattson et al., in press). Across the 20 reviewed studies, definitions of scripted vs unscripted responses varied greatly. Some authors (Garcia-Albea et al., 2014; Ledbetter-Cho et al., 2015; Mattson et al., in press; Pollard et al., 2012) only considered a verbal response unscripted if the wording varied by specific parameters from the initial training scripts. For example, if the script “I like puppies” was taught, these researchers would consider “I like puppies” to be a scripted phrase regardless of the presence or absence of the script. While other researchers (Krantz & McClannahan, 1993; Krantz & McClannahan, 1998; MacDuff et al., 2007) consider all verbal behavior unscripted the moment the script was gone or began to be faded. Additionally, the parameters used by researchers who use stricter
definitions of scripted and unscripted responses can also vary. These inconsistencies make it difficult to determine how effective script training and fading is at promoting new language. Thus, it may be important to continue to use strict operational definitions in future research.

In eight of the studies reviewed, researchers pretrained participants on how to use the scripts or auditory script device (Betz et al., 2011; Reagon & Higbee, 2009; Sarokoff et al., 2001), or taught them both reading and script (Brodhead et al., 2016; Groskreutz et al., 2015; Krantz & McClannahan, 1998; Sellers et al., 2016). Six of these studies used textual scripts (Brodhead et al., 2016; Groskreutz et al., 2015; Krantz & McClannahan, 1998; Sarokoff et al., 2001; Sellers et al., 2016). Considering the age of some of the participants, pretraining may have been needed due to low reading skills. Thus, it may not be appropriate to use textual scripts with prereading children. The researchers use of echoic prompts during training, may also be related to potential reading deficits of participants. Auditory scripts, which are similar to echoic prompts, provide an alternative to textual scripts that may be more appropriate for nonreaders. However, a few researchers activated the auditory script device behind, out of sight of the participant (Garcia-Albea et al., 2014; Howlett et al., 2011), making the similarities between the auditory script and an echoic prompt even stronger.

Many of the researchers using auditory scripts teach the participant to activate the auditory script device themselves (see MacDuff et al., 2007 for an example) which may lead to the auditory script device become a visual stimulus associated with responding rather than just functioning as an auditory script. Some of the research has shown that the
visual stimuli aspect of visual scripts and auditory script devices, or even researcher’s
presence, may develop stimulus control over participants responding (e.g., Reagon &
Higbee, 2009; Sarokoff et al., 2001) which may make fading of those visual stimuli
difficult or ineffective. Mattson et al.’s (in press) study highlights how the participant’s
verbal behavior can come under the control of picture cues, showing that text may not
even be necessary for visual scripts. However, these picture cues still need to be faded
from the participant’s environment. The findings from Mattson et al.’s study also
suggests that script frames can become associated with visual stimuli other than that of
typical scripts. Perhaps, the visual features of the toys present during play can be these
visual stimuli. If we are able to tie script frames directly to these toys using echoic
prompts, then fading of visual stimuli would not be necessary.

**Purpose and Research Questions**

The purpose of this study is to extend the literature on communication during play
by investigating whether or not visual aids such as scripts and picture cues are necessary
to teach preschool aged autistic children to make contextually appropriate play statements
while playing with playsets. This study will address the following questions.

1. Can preschool aged autistic children be taught to make contextually appropriate
   play statements using varied verbal prompting and prompt fading procedures
   without the aid of visual cues (e.g., picture cues and traditional textual scripts)?
   a. How variable are the contextually appropriate play statements?
   b. Do novel contextually appropriate play statements emerge?

2. How does play commenting maintain after 1- and 2-weeks?

3. How does play commenting generalize to novel play sets?
CHAPTER III

METHODS

Participants and Setting

We recruited four autistic preschool-aged children to participate in this study. Prior to starting, we obtained informed consent from participants’ caregivers. In order to be included in this study, potential participants demonstrated a vocal repertoire of a) echoics-imitating three- to four-word sentences and b) tacting-labeling various items in their environment. We acquired this information through discussions with each participant’s case manager. Additionally, we withdrew participant participation in this study if participants did not tolerate physical prompting or engaged in challenging behavior across multiple sessions.

Eddy was a 4-year-old Asian American boy. He attended the university-based preschool for autistic children and received ABA-based instruction in a small kindergarten-prep group for 12 hours per week. Eddy communicated vocally using phrases and sentences and demonstrated that he could imitate two- to five-word sentences. He also demonstrated that he could label various colors, shapes, and objects in his instructional environment. During play, he would interact with various aspects of the playset, but did not make any comments, statements, or bids for joint attention.

Earl was a 3-year-old European American boy. He attended the university-based preschool for autistic children and received one-on-one ABA instruction 20 hours per week. Earl communicated vocally using phrases and demonstrated that he could imitate
two- to five-word sentences. He also demonstrated that he could label various colors, shapes, and objects in his instructional environment. During play, he would interact with various aspects of the playset and occasionally made some comments, statements, or bids for joint attention. His comments/statements/bids during play primarily consisted of one word or sound effects.

Walt was a 3-year-old European American boy. He attended the university-based preschool for autistic children and received one-on-one ABA instruction 20 hours per week. Walt communicated vocally using single words and occasionally short phrases and demonstrated that he could imitate two- to four-word sentences. He also demonstrated that he could label various colors, shapes, and objects in his instructional environment. During play, he would interact with various aspects of the playset, but did not make any comments, statements, or bids for joint attention.

Tom was a 4-year-old European American boy. He attended the university-based preschool for autistic children and received one-on-one ABA instruction 20 hours per week. Tom communicated vocally using phrases and sentences and demonstrated that he could imitate two- to five-word sentences. He also demonstrated that he could label various colors, shapes, and objects in his instructional environment. During play, he would interact with various aspects of the playset and occasionally made some comments, statements, or bids for joint attention. His comments/statements/bids during play were not always related to the playset and often consisted of one-word statements or sound effects. We withdrew Tom’s participation in this study due to challenging behavior that occurred across multiple sessions once cue training was introduced. Tom began to
attempt to remove the picture cues or move away from the play materials during some sessions. Additionally, Tom’s responding to the echoic prompts delivered by the research assistant became inconsistent with him only responding occasionally. We attempted to modify Tom’s procedures by increasing the dosage (see procedures below) and restarting with new playsets. While some sessions went well, we continued to observe challenging behavior across sessions and days. After ending a behavioral skills training (BST) session early across two days, we decided it was best to withdraw Tom from the study.

We conducted all research sessions in a 2 m x 3 m research room at a university-based preschool for autistic children. The room contained a ceiling mounted camera and was clear of all furniture. The only materials present in the room were the playsets and the research assistant’s Motivaider, script frame order, and dry erase marker (the research assistant’s materials were not present during baseline sessions). All sessions were recorded using the room camera system and data were scored afterwards from these recordings.

**Materials**

We used playsets that included both figurines/object and structures in this study. Playsets included one structure and two people/objects relating to the structure. For example, one playset included a pizza parlor with a delivery driver and a moped (see Figure 1). For each participant, we randomly assigned playsets to either the training or generalization group. We determined which playsets we would use by conducting a brief multiple stimulus without replacement (MSWO; Carr et al., 2000) preference assessments
with each participant. We selected the second, third, and fourth place playsets from each group to use in research sessions. Training playsets were used for all baseline, training, cue training, pre-session BST, and maintenance sessions (Table 2). While generalization playsets used for all generalization probe sessions (Table 3). When we decided to restart Tom, we identified additional playsets for Tom following the same procedures (Table 4).

**Figure 1**

*Playset with Picture Cues Attached*

![Playset with Picture Cues Attached](image)

**Table 2**

*Training Playsets*

<table>
<thead>
<tr>
<th>Participant</th>
<th>Toy</th>
<th>Yellow cue locations</th>
<th>Red cue locations</th>
<th>Blue cue locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eddy</td>
<td>Construction</td>
<td>Contractor/Worker</td>
<td>Elevator/Gate</td>
<td>Slide/Crane</td>
</tr>
<tr>
<td></td>
<td>Vet</td>
<td>Helicopter/Cat</td>
<td>Bath/Door</td>
<td>Tree/Food</td>
</tr>
<tr>
<td></td>
<td>Pizza Parlor</td>
<td>Motorcycle/Driver</td>
<td>Sign/Table</td>
<td>Door/Window</td>
</tr>
<tr>
<td>Earl</td>
<td>Treehouse</td>
<td>Dog/Boy</td>
<td>Swing/Tree</td>
<td>Doghouse/Window</td>
</tr>
<tr>
<td></td>
<td>Construction</td>
<td>Contractor/Worker</td>
<td>Elevator/Gate</td>
<td>Slide/Crane</td>
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<td></td>
<td>Vet</td>
<td>Helicopter/Cat</td>
<td>Bath/Door</td>
<td>Tree/Food</td>
</tr>
</tbody>
</table>

(Additional text and table content continues as needed.)
### Table 3

**Generalization Playsets**

<table>
<thead>
<tr>
<th>Participant</th>
<th>Toy</th>
<th>Yellow cue locations</th>
<th>Red cue locations</th>
<th>Blue cue locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eddy</td>
<td>Princess Aquarium Camper</td>
<td>Ariel/Cinderella Dolphin/Boy Buzz/Jessie</td>
<td>Door/Rose Fish/Pool Wheel/Door</td>
<td>Clock/Slide Flag/Slide Cooler/Bed</td>
</tr>
<tr>
<td>Earl</td>
<td>School Princess Frozen</td>
<td>Teacher/Student Ariel/Cinderella Elsa/Olaf</td>
<td>Earth/Bell Door/Rose Snowflake/Door</td>
<td>Clock/Door Clock/Slide Slide/Stairs</td>
</tr>
<tr>
<td>Walt</td>
<td>Princess Frozen Vet</td>
<td>Ariel/Cinderella Elsa/Olaf Helicopter/Cat</td>
<td>Door/Rose Snowflake/Door Bath/Door</td>
<td>Clock/Slide Slide/Stairs Tree/Food</td>
</tr>
<tr>
<td>Tom</td>
<td>Treehouse Pizza Parlor Camper</td>
<td>Dog/Boy Driver/Motorcycle Buzz/Jessie</td>
<td>Swing/Tree Sign/Table Wheel/Door</td>
<td>Doghouse/Window Door/Window Cooler/Bed</td>
</tr>
</tbody>
</table>

*Note.* Italicized locations were the locations used during pre-session BST.

### Table 4

**Tom’s New Playsets**

<table>
<thead>
<tr>
<th>Participant</th>
<th>Toy</th>
<th>Yellow cue locations</th>
<th>Red cue locations</th>
<th>Blue cue locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tom Training</td>
<td>Zoo Castle Frozen</td>
<td>Keeper/Giraffe Horse/Knight Elsa/Olaf</td>
<td>Ramp/Barn Tree/Gate Snowflake/Door</td>
<td>Tree/Swing Bed/Door Slide/Stairs</td>
</tr>
<tr>
<td>Tom Gen Construction House Farm</td>
<td>Contractor/Worker Mom/Girl Farmer/Cow</td>
<td>Elevator/Gate Window/House Mud/Barn</td>
<td>Slide/Crane Bed/Stairs Gate/Bed</td>
<td></td>
</tr>
</tbody>
</table>
If participants’ play commenting did not increase during training without visual aids, picture cues were added. Picture cues acted as a visual aid to prompt play commenting. These picture cues were the same as those used in Mattson et al. (in press) and consisted of a small picture of a face and a speech bubble attached to a colored background and laminated (see Figure 2). Picture cues were attached to playsets using Velcro (see Figure 1). Each colored picture cue was associated with a different script frame a) yellow was associated with “I’m playing with (object),” b) red was associated with “look at (object/aspect),” and c) blue was associated with “I found (object/aspect).” Additionally, each cue was associated with two different objects/aspects of the playset (Tables 2, 3, and 4). During pre-session BST, we kept the cues consistently in the first location.

Figure 2

Picture Cues

Dependent Variables

The primary dependent variable was the number of independent contextually appropriate play statements during a five-minute research session. An independent contextually appropriate play statement was defined as any statement made by the participant that was intelligible, contained two or more words, related to some aspect of
the playset, and was not immediately preceded by an echoic prompt. For example, if the playset contained a pizza shop, a driver, and a motorcycle, “The motorcycle is driving” would count as an independent contextually appropriate play statement while “driver” or “(unintelligible) pizza (unintelligible)” would not. Additionally, any whispers were counted as unintelligible because they could not be heard by the play partner sitting near the participant. Further, the statement could not be an echoic of the play partner’s behavior. For example, if the play partner said “wow, look at the motorcycle go” and the participant repeated “wow, look at the motorcycle go” immediately afterwards, then it would not be scored as an independent contextually appropriate play statement.

First, we transcribed all of the contextually appropriate play statements. We then scored the independence of the play statement, whether or not attending prompts were delivered, the participant’s engagement during the play statement, as well as the type of play statement (e.g., novel, mixed, adapted, exact; See Appendix A for our data collection sheet). Each contextually appropriate play statement was scored as independent or prompted. If the participant made the contextually appropriate play statement without an echoic prompt, it was scored as independent. If the research assistant provided an echoic prompt (e.g. a vocal model of the desired response) prior to the contextually appropriate play statement, then it was scored as prompted. Additionally, once the cues were introduced, we collected data on the delivery of attending prompts. Attending prompts were when the research assistant physically guided the participant to interact with the picture cue (e.g., guiding the participant to touch the picture cue). If an attending prompt was delivered prior to the play statement, we scored this as “yes” under
attending prompt. If no attending prompt was delivered, we scored this as “no” under attending prompt. We collected these data because independent contextually appropriate play statements only needed to be independent of echoic prompts and we wanted to also examine whether the independent play statements observed still required the attending prompt. We also collected data on the participants’ engagement with the playset during the contextually appropriate play statements. If the participant was making physical contact with or pointing to an aspect of the playset we scored it as a “yes” under engagement. If the participant was not making physical contact with or pointing to an aspect of the playset, or needed to be prompted to do so, then that was scored as a “no.”

We also coded the type of contextually appropriate play statement as either exact statements, adapted statements, mixed statements, or novel statements. Following with Mattson et al. (in press) this allowed for a more detailed analysis of how the training may have affected the participants’ communication – is the training promoting rote or novel communication? An exact statement was defined as having point-to-point correspondence with the three training frames taught in the study: “Look at (object/aspects),” “I found (object/aspects),” and “I’m playing with (object)” (Groskreutz et al., 2015; Mattson et al., in press). An adapted statement was defined as differing from the training frames by more than articles, prepositions, and/or pronouns (e.g., The motorcycle is fast! Look at it drive.”). A mixed statement was defined as including components from two or more of the training frames (e.g., “I’m playing with the motorcycle, look at the driver.”). We defined novel statements as any contextually
appropriate play statement that did not contain any components of the training frames (e.g., “The pizza is yummy.”).

**Interobserver Agreement**

A second interdependent observer collected data on all dependent variables for at least 30% of sessions for each condition. We evaluated interobserver agreement (IOA) by comparing the secondary observers transcribed contextually appropriate play statements with the data collected by the primary data collector. For each transcribed contextually appropriate play statement, an agreement or disagreement was scored on a) the transcribed statement, b) the time the statement occurred, c) the independence of the statement, d) the type of statement, and e) engagement. Additionally, once picture cues were introduced an agreement or disagreement was scored on the delivery of an attending prompt. See Table 5 for how agreements were scored. We then calculated IOA by taking the total number of agreements and dividing them by the total number of agreements plus disagreements and multiplying by 100 to produce a percent. See Table 6 for a summary of our IOA.

**Table 5**

*IOA Agreement Scoring*

<table>
<thead>
<tr>
<th>IOA Evaluation</th>
<th>An agreement was scored if:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transcribed statement</td>
<td>Transcribed contextually appropriate play statements matched</td>
</tr>
<tr>
<td>Time of statement</td>
<td>Occurred at the same time</td>
</tr>
</tbody>
</table>
Independence of statement
Agreed on the independence of the play statement (e.g., both scored “+”)

Type of statement
Agreed on the type of the play statement (e.g., both score the play statement as an “exact statement”)

Engagement
Agreed on the engagement of the participant (e.g., both scored “yes”)

Attending prompt
Agreed on the delivery of the attending prompt (e.g., both scored “yes”)

Table 6

Mean IOA and Range Percentages

<table>
<thead>
<tr>
<th>Participant</th>
<th>Baseline</th>
<th>No Visual Aid Training</th>
<th>Visual Cue Training</th>
<th>BST</th>
<th>Double Dosage</th>
<th>No Cue</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eddy</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>98.4 (92-100)</td>
<td>N/A</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Earl</td>
<td>100</td>
<td>91 (86-97)</td>
<td>97 (96-100)</td>
<td>N/A</td>
<td>N/A</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Walt</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>N/A</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Tom</td>
<td>98 (80-100)</td>
<td>97 (94-100)</td>
<td>100</td>
<td>100</td>
<td>98 (94-100)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Note. This table includes mean IOA scores. Ranges are included in parentheses.

Play Partner and Research Assistant Training

We trained play partners and research assistants on their roles and the procedures described below using behavioral skills training (BST; Sarokoff & Sturmey, 2004). We trained individuals assisting with this project on both roles, as they were needed to be the play partner for some sessions and the research assistant for others. We first described what each of the roles do during the research sessions as well as provided a written description of what was expected (Appendix B). Then, we modeled the behavior of each
role. For the play partner, this included: a) setting up the session, b) positioning in the room, and c) responding to contextually appropriate play statements or questions and unrelated statement or questions. For the research assistant, this included: a) positioning in the room and b) correct prompting (e.g., echoic and engagement prompts). Finally, they roleplayed each role and were provided feedback on their performance until they were no longer making mistakes and indicated that they felt ready to be the play partner and research assistant.

**Treatment Integrity**

We collected data on both the play partner’s and research assistant’s implementation of the procedures. Treatment integrity data were collected for at least 30% of sessions for each condition. For play partners, we evaluated a) the presence of the correct playset, b) the presence of the picture cues, if needed, c) the delivery of the initial instruction to play, d) correct positioning in the room (e.g., across from the participant), e) responding to contextually appropriate play statements and requests, f) redirection of unrelated statements and requests, g) not providing any instructions or questions (see Appendix C). We evaluated the research assistant on a) correct positioning in the room (e.g., behind the participant), b) delivery or echoic prompts, if needed, c) delivery of engagement prompts, if needed, d) delivery of attending prompts, if needed, and e) not providing any instructions or questions (see Appendix D). We also evaluated the implementation of BST a) the presence of the correct playset, b) the presence of the picture cues, c) describing the purpose/meaning of the picture cues, d) modeling how to
use the picture cues, and e) providing the participant with an opportunity to practice (see Appendix E). See Table 7 for a summary of our treatment integrity.

**Table 7**

*Mean Treatment Integrity and Range Percentages*

<table>
<thead>
<tr>
<th>Participant</th>
<th>Baseline</th>
<th>No Visual Aid Training</th>
<th>Visual Cue Training</th>
<th>BST</th>
<th>Double Dosage</th>
<th>No Cue</th>
<th>Maintenance</th>
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</thead>
<tbody>
<tr>
<td><strong>Play Partner</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eddy</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>97.6 (88-100)</td>
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<td>100</td>
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<tr>
<td>Earl</td>
<td>84 (63-100)</td>
<td>96</td>
<td>100</td>
<td>N/A</td>
<td>N/A</td>
<td>99 (98-100)</td>
<td>91 (83-100)</td>
</tr>
<tr>
<td>Walt</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Tom</td>
<td>96 (73-100)</td>
<td>95 (91-100)</td>
<td>96 (82-100)</td>
<td>100</td>
<td>97 (91-100)</td>
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<td>N/A</td>
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<tr>
<td><strong>Research Assistant</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
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<td>100</td>
<td>100</td>
<td>100</td>
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<td>100</td>
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<tr>
<td>Earl</td>
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<td>100</td>
<td>100</td>
<td>N/A</td>
<td>N/A</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Walt</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>N/A</td>
<td>N/A</td>
<td>100</td>
</tr>
<tr>
<td>Tom</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td><strong>BST</strong></td>
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<tr>
<td>Eddy</td>
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<td>N/A</td>
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<td>Earl</td>
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<td>N/A</td>
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<td>N/A</td>
<td>N/A</td>
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<tr>
<td>Walt</td>
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<td>N/A</td>
<td>N/A</td>
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<td>N/A</td>
<td>N/A</td>
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<td>Tom</td>
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<td>N/A</td>
<td>100</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

*Note.* This table includes mean treatment integrity scores. Ranges are included in parentheses.

A second independent observer collected IOA on treatment integrity data for at least of 30% of sessions in which we evaluated treatment integrity. We calculated IOA by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100 to produce a percent. An agreement is defined as both data collectors...
scoring the treatment integrity step the same way. See Table 8 for a summary of our treatment integrity IOA.

**Table 8**

*Mean Treatment Integrity IOA and Range Percentages*

<table>
<thead>
<tr>
<th>Participant</th>
<th>Baseline</th>
<th>No Visual Aid Training</th>
<th>Visual Cue Training</th>
<th>BST</th>
<th>Double Dosage</th>
<th>No Cue</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Play Partner</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eddy</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>N/A</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Earl</td>
<td>88 (75-100)</td>
<td>100</td>
<td>98 (95-100)</td>
<td>N/A</td>
<td>N/A</td>
<td>97 (96-98)</td>
<td>94 (87-100)</td>
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<tr>
<td>Walt</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>N/A</td>
<td>N/A</td>
<td>100</td>
</tr>
<tr>
<td>Tom</td>
<td>94 (82-100)</td>
<td>95</td>
<td>94 (88-100)</td>
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<td>91</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Research Assistant</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Eddy</td>
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<td>100</td>
<td>100</td>
<td>100</td>
<td>N/A</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Earl</td>
<td>100</td>
<td>100</td>
<td>94 (89-100)</td>
<td>N/A</td>
<td>N/A</td>
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<td>100</td>
</tr>
<tr>
<td>Walt</td>
<td>100</td>
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<td>100</td>
<td>100</td>
<td>N/A</td>
<td>N/A</td>
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</tr>
<tr>
<td>Tom</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>BST</strong></td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Eddy</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>100</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Earl</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Walt</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>100</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Tom</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>100</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

*Note.* This table includes mean treatment integrity IOA scores. Ranges are included in parentheses.

**Experimental Design**

We used a non-concurrent multiple baseline design across participants to evaluate the effects of training play commenting without visual aids. Additionally, a reversal
component was embedded to evaluate the cue training procedures that were implemented for all participants. The conditions were implemented as follows: baseline, generalization probes, no visual aid training, cue training, BST (Eddy and Walt), generalization probes, no cue, no cue generalization probes (Earl), BST (Eddy and Walt), and maintenance. We initially attempted different modifications with Tom and “restarted” him with new play sets. During this restart, his conditions were implemented as follows: baseline, generalization probes, no visual aid training, cue training, double dosage prompting, baseline (new toys, cues present), cue training (new toys), BST (new toys) until his withdrawal.

**Procedures**

**General Session Procedures**

Prior to the start of each session, we set up the room ensuring that it was empty of furniture, that the correct playset was present, and that the camera system was recording. A play partner and a research assistant were present for every session. The play partner sat near the participant (e.g., next to or across from) while the research assistant sat generally behind (e.g., not in direct view of) the participant. The research assistant was already in the room before the play partner and participant entered.

All research sessions were five minutes long and no more than four sessions were run in a day. Each session began with the play partner providing the instruction “Let’s play ______.” During the research session, the play partner responded to any contextually appropriate play statements made by the participant. The play partner’s responses were
not scripted but were related to the contextually appropriate play statement made by the participant. For example, if the participant made the motorcycle drive by and said, “The motorcycle is driving” the play partner could respond “It’s going so fast.” If the participant made a comment or request unrelated to the playset, the play partner responded by saying “let’s keep playing.”

Baseline

During baseline sessions, the play partner responded to the participants contextually appropriate statements and requests and unrelated statements and requests as described in the general procedure above. The research assistant was present in the research room but did not provide any prompts or engage with the participant or playset at all. During Tom’s second baseline, picture cues were attached to the playset, but the research assistant did not provide any prompts to interact with them.

Baseline Generalization

Baseline generalization probes were run identical to baseline sessions except that the generalization playsets were used instead of the training playsets. We conducted one baseline generalization session with each of the three generalization playsets.

No Visual Aid Training

During training, the research assistant prompted the participant to make a contextually appropriate play statement every 20 seconds. They used a Motivaider to
indicate when they needed to prompt the participant. If the participant made an independent contextually appropriate play statement, the research assistant restarted the Motivaider. When the Motivaider signaled, the research assistant used an echoic prompt that incorporated one of three different script frames “Look at (object),” “I found (object),” and “I’m playing with (object)” (Groskreutz et al., 2015; Mattson et al., in press). We presented these frames in a semi-random order that was determined prior to the start of the session. If the participant was engaged with an aspect of the playset, the echoic prompt related to that aspect. For example, if the participant was making the motorcycle drive and the frame for that opportunity was “I found (object),” the research assistant prompted the participant to say “I found motorcycle.” If the participant was not engaged with the playset, the research assistant prompted them to engage with an aspect of the playset and provided an echoic prompt related to that aspect. For example, if the frame for that opportunity was “look at (object)” and the participant was not engaged with the playset, the research assistant prompted the participant to point to the pizza and say “look at the pizza.” Mastery criteria for this phase was two consecutive sessions with two or fewer echoic prompts. If participants were not making progress in this condition, as indicated by a stable or decreasing trend in their data, picture cues were introduced.

**Visual Cue Training**

Visual cue training occurred using procedures similar to those used by Mattson et al. (in press). Visual cues were attached to various aspects of the playset. The location of these cues rotated in a semi-random order. Similar to no visual aid training, the research
assistant used a Motivaider set to 20 seconds to indicate when to prompt the participant. As in no visual aid training, if the participant made an independent contextually appropriate play statement, the Motivaider was reset. During cue training, the research assistant used both an attending prompt (e.g., physically prompting the participant to touch the cue) and an echoic prompt. For the first two sessions of this condition, the research assistant prompted both the attending prompt and the echoic prompt simultaneously (0-s delay). For example, the research assistant prompted the participant to touch the cue attached to the motorcycle and simultaneously provide the echoic prompt “I’m playing motorcycle.”

We used a progressive prompt delay (0-s, 2-s, and 4-s; Walker, 2008; Mattson et al., in press) to fade echoic prompts. During the 2-s prompt delay, the research assistant provided the attending prompt then, if needed, two seconds later provided the echoic prompt. For example, when the Motivaider signaled, the research assistant prompted the participant to touch the cue attached to the motorcycle and waited 2 seconds. If the participant independently said the relevant contextually appropriate play statement, then they did not provide the echoic prompt. However, if the participant said the incorrect script frame (e.g. said “look at motorcycle” instead of “I’m playing motorcycle” for the yellow picture cue), said something not contextually appropriate, or did not say anything, the research assistant provided the echoic prompt “I’m playing motorcycle.” Mastery criteria for moving to the next prompt delay was two consecutive sessions at two or fewer attending plus echoic prompts. Mastery criteria for the visual cue training condition was two consecutive sessions at two or fewer attending plus echoic prompts with a 4-s prompt
delay. If participants were not making progress in this condition, as indicated by a stable or decreasing trend in their data, pre-session BST was introduced.

**Double-Dosage Prompting (Tom).** Sessions were identical to the visual cue training procedures except that the Motivaider was set to 10 seconds instead of 20. This was our first attempt at a modification to the cue training procedures. Unfortunately, it was not successful. We made this modification due to Tom’s lack of progress during cue training as well as his challenging behavior of attempting to remove cues and moving away from the playsets. We saw an increase in challenging behavior with one of the playsets and were only seeing an increase in independent contextually appropriate play statements with one of the other two playsets. Thus, we decided to “restart” him with new playsets.

**Pre-Session BST**

Prior to the start of each 5-minute session, BST was conducted with the participant. Additionally, during this condition, we stopped the semi-random rotation of the location of the picture cues. During BST, we used the training playset for that session. For example, if the Pizza Shop was the playset for that session, it was also used during the pre-session BST. During BST, the research assistant first described the purpose/meaning of the picture cues (e.g., “I’m going to show you how you can use some picture cues to know what you can say while you’re playing. This yellow one means you can say ‘I’m playing with,’ the red one means you can say ‘look at the,’ and the blue one means you can say ‘I found the’”). Then the research assistant modeled how to use each
of the picture cues by pointing to the picture cue and saying the associated script frame. After each model, the research assistant had the participant practice using that picture cue. Finally, the research assistant had the participant practice using all of the picture cues by providing attending prompts to the three picture cues in a semi-random order. Feedback was provided for incorrect or no responding by reminding the participant what that picture cue meant (e.g., remember the yellow one means “I’m playing motorcycle”) or by providing additional models. BST was concluded when the participant independently responded to the picture cues. The research session following BST was identical to the cue training condition, except that a 4-s prompt delay was implemented. Mastery criteria for the BST condition was two consecutive sessions at two or fewer attending plus echoic prompts with the 4-s prompt delay.

Training Generalization Probes

Training generalization probes were run following the last training procedures that were effective for that participant, cue training for Earl and BST for Eddy and Walt. We conducted one training generalization session with each of the three generalization playsets.

No Cue

Following the participant meeting mastery criteria, we removed the cues to observe if participants would continue making independent contextually appropriate play
statements when the cues were no longer present. The procedures in this condition were identical to baseline procedures.

**No Cue Generalization Probes (Earl).** Because Earl continued to make contextually appropriate play statements when the cues were removed, we conducted generalization probes with these procedures to observe if this responding would also generalize to the generalization playsets. We conducted one no cue generalization probe with each of the three generalization playsets.

**Maintenance**

Maintenance was assessed one- and two-weeks following no cue generalization probes for Earl and BST reintroduction sessions for Eddy and Walt. Maintenance sessions were run following the last condition for that participant, no cue for Earl and BST for Eddy and Walt. We conducted one maintenance session for each of the training playsets at both the one- and two-week maintenance checks.
CHAPTER IV

RESULTS

Number of Independent Contextually Appropriate Play Statements

Figure 3 shows the number of independent contextually appropriate play statements for Eddy, Earl, and Walt. Figure 4 shows the number of independent contextually appropriate play statements for Tom. Table 9 shows the percent of independence during training conditions for all four participants. Table 10 shows the percent of engagement for all conditions for all four participants. The results of Eddy, Earl, Walt, and Tom are described below.

Eddy

Eddy’s results are presented in the top panel of Figure 3. During baseline and the baseline generalization probes, Eddy did not make any independent contextually appropriate play statements. Eddy did engage with the playsets and occasionally whispered during baseline sessions and baseline generalization probes, but none of his whispers were intelligible. When training with visual aids was introduced, Eddy responded to all of the echoic prompts, but did not make any independent contextually appropriate play statements. Similarly, when the picture cues were introduced, Eddy continued responding to all of the echoic prompts, but did not make any independent contextually appropriate play statements to the attending prompts or on his own.
Figure 3

*Number of Independent Contextually Appropriate Play Statements for Eddy, Earl, and Walt*

![Graph showing the number of independent contextually appropriate play statements for Eddy, Earl, and Walt. The graph includes data points for baseline, TR, Cue TR, BST, No Cue, BST, and Maintenance sessions. Different symbols represent different playsets. TR = no visual aid training, Cue TR = visual cue training, BST = pre-session BST.]*

*Note.* Closed data points indicate training playsets, while open data points indicate generalization playsets. Closed data points not connected by data paths indicate maintenance sessions. Different symbols represent different playsets. TR = no visual aid training, Cue TR = visual cue training, BST = pre-session BST.

Figure 4

*Number of Independent Contextually Appropriate Play Statements for Tom*
Note. Closed data points indicate training playsets, while open data points indicate generalization playsets. Closed data points not connected by data paths indicate maintenance sessions. Different symbols represent different playsets. TR = no visual aid training, Cue TR = visual cue training, BST = pre-session BST. 1 = first training and generalization playsets (Tables 2 & 3). 2 = new training and generalization playsets (Table 4).

Table 9

Mean Independence During Training Conditions and Range Percentages

<table>
<thead>
<tr>
<th>Participant</th>
<th>No Visual Aid Training</th>
<th>Visual Cue Training</th>
<th>BST</th>
<th>Double Dosage</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No E No A/E</td>
<td>No E No A/E</td>
<td>No E No A/E</td>
<td>No E No A/E</td>
<td>No E No A/E</td>
</tr>
<tr>
<td>Eddy</td>
<td>0 0</td>
<td>0 0</td>
<td>70.6 (0-100)</td>
<td>2 (0-20)</td>
<td>N/A N/A</td>
</tr>
<tr>
<td>Earl</td>
<td>41.3 (11-62)</td>
<td>74.9 (0-100)</td>
<td>N/A N/A</td>
<td>N/A N/A</td>
<td>N/A N/A</td>
</tr>
<tr>
<td>Walt</td>
<td>0 0</td>
<td>11 0</td>
<td>65.3 (12-100)</td>
<td>2.6 (0-8)</td>
<td>N/A N/A</td>
</tr>
<tr>
<td>Tom</td>
<td>37.3 (15-42)</td>
<td>14.7 (0-33)</td>
<td>41.7 (0-77)</td>
<td>5.5 (0-22)</td>
<td>24.2 (0-64)</td>
</tr>
</tbody>
</table>

Note. This table includes mean independence scores. Ranges are included in parentheses. Scores for no echoic and no attending/echoic are the same during no visual aid training because attending prompts were not delivered during this condition. E = echoic prompt, A = attending prompt.
Table 10

*Mean Engagement During Play Statements and Range Percentages*

<table>
<thead>
<tr>
<th>Participant</th>
<th>Baseline</th>
<th>No Visual Aid Training</th>
<th>Visual Cue Training</th>
<th>BST</th>
<th>Double Dosage</th>
<th>No Cue</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eddy</td>
<td>N/A</td>
<td>100</td>
<td>96 (80-100)</td>
<td>97.6 (83-100)</td>
<td>N/A</td>
<td>N/A</td>
<td>100</td>
</tr>
<tr>
<td>Earl</td>
<td>100</td>
<td>100</td>
<td>92.3 (0-100)</td>
<td>N/A</td>
<td>N/A</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Walt</td>
<td>N/A</td>
<td>78.2 (36-100)</td>
<td>100</td>
<td>100</td>
<td>N/A</td>
<td>N/A</td>
<td>100</td>
</tr>
<tr>
<td>Tom</td>
<td>100</td>
<td>96.9 (81-100)</td>
<td>91.9 (27-100)</td>
<td>22.1 (0-78)</td>
<td>83.8</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

*Note.* This table includes mean engagement scores. Ranges are included in parentheses.

BST was introduced during session 19. Initially Eddy’s responding remained low. However, his independent contextually appropriate play statements began increasing during session 22 and he met mastery criteria across sessions 23 and 24 (M = 4.7). Overall, the number of independent contextually appropriate play statements emitted by Eddy was higher during BST than all previous conditions. During the BST generalization probes, Eddy continued to emit independent contextually appropriate play statements (M = 9). When the picture cues were removed, Eddy’s responding immediately returned to baseline levels (M = 0). Once the picture cues and BST were reintroduced Eddy’s responding increased back to the level of when he met mastery (M = 11.2). While Eddy was making independent contextually appropriate play statements, these play statements were almost always preceded by an attending prompt (see Table 9). Additionally, Eddy was consistently independently engaged with the playsets during contextually appropriate play statements (Table 10).
Earl’s results are presented in the middle panel of Figure 3. Initially, during baseline, Earl engaged in a few independent contextually appropriate play statements, but his responding eventually stabilized at 0 (M = 1.9). During the baseline generalization probes, he made some independent contextually appropriate play statements, similar to baseline levels (M = 1.7). During baseline and baseline generalization probes, Earl engaged with the playset and made multiple one-word statements and sound effects. When training without visual aids was introduced, Earl’s number of independent contextually appropriate play statements increased (M = 7.8); however, his independence was low, and he did not meet mastery criteria (M = 41.3%; Table 9).

After we introduced the picture cues, Earl’s number of independent contextually appropriate play statements increased further (M = 13.8) and he met mastery criteria across sessions 25 and 26. Additionally, many of his independent contextually appropriate play statements were independent of both echoic and attending prompts (M = 66.3; Table 9). During the training generalization probes, Earl continued making independent contextually appropriate play statements (M = 22.3).

After we removed the picture cues, Earl continued responding, making more independent contextually appropriate play statements (M = 24.8) than the previous training condition. We conducted further generalization probes, with the picture cues removed, and Earl continued to make independent contextually appropriate play statements (M = 33). Additionally, Earl maintained his level of responding for two of the three maintenance sessions at each the one- and two- week maintenance checks (M =
28.2). The playsets with decreased responding varied across maintenance checks, but the decreased responding occurred during the last of the three sessions each time. Additionally, Earl was consistently independently engaged with the playsets during contextually appropriate play statements (Table 10).

**Walt**

Walt’s results are presented in the bottom panel of Figure 3. During baseline and the baseline generalization probes, Walt did not make any independent contextually appropriate play statements. Walt did engage with the playsets, but he primarily played with the toys silently. When training without visual aids was introduced, Walt responded to all of the echoic prompts, but did not make any independent contextually appropriate play statements. When the picture cues were introduced, Walt’s independent contextually appropriate play statements increased slightly (M = 1), but he did not meet mastery criteria.

After we introduced BST, we observed Walt’s independent contextually appropriate play statements gradually increase and he met mastery criteria across sessions 41 and 42 (M = 5.8). Overall, the number of independent contextually appropriate play statements emitted by Walt was higher during BST than all previous conditions. During the BST generalization probes, Walt continued to emit independent contextually appropriate play statements (M = 9). When the picture cues were removed, Walt’s responding immediately returned to baseline levels (M = 0). Once the picture cues and BST were reintroduced Walt’s responding increased back to the level of when he met
mastery (M = 7.8). While Walt was making independent contextually appropriate play statements, these play statements were almost always preceded by an attending prompt (see Table 9). Additionally, Walt was consistently independently engaged with the playsets during contextually appropriate play statements (Table 10).

**Tom**

Tom’s results are presented in Figure 4. Initially, during baseline, Tom engaged in a few independent contextually appropriate play statements (M = 1.9). During his first baseline generalization probe, he engaged in a much higher number of independent contextually appropriate play statements; however, his responding decreased back to baseline levels for the other two generalization playsets and the second baseline generalization probe with the first playset (M = 5.7). During baseline and baseline generalization probes, Tom engaged with the playset and made multiple one-word statements and sound effects. When training without visual aids was introduced, Tom’s number of independent contextually appropriate play statements increased from baseline (M = 5.5); however, his independence was low, and he did not meet mastery criteria (M = 37.3%; Table 9).

After we introduced the picture cues, Tom’s number of independent contextually appropriate play statements decreased (M = 1.3) and he began engaging in challenging behavior during some research sessions. We modified the cue training procedure to double the dosage, prompting every 10-s instead of every 20-s. Tom’s number of independent contextually appropriate play statements did increase again in this condition.
(M = 5.4), but his independence continued to be low, and he continued to engage in challenging behavior during some research sessions. We observed that his challenging behavior occurred most often with one of the playsets. We removed this playset after session 28 and alternated between the remaining two playsets. Tom’s responding only increased with one of the remaining playsets and we continued to observe some challenging behavior in some research sessions.

We decided to “restart” Tom with new playsets and only attempt to use the cue training procedures. Additionally, following Mattson et al.’s (in press) original procedures, the picture cues were present during the new baseline sessions. During the new baseline sessions, Tom made some independent contextually appropriate play statements (M = 5.9). During the baseline generalization probes, Tom made fewer independent contextually appropriate play statements (M = 2.7). After we reintroduced cue training, the number of Tom’s independent contextually appropriate play statements (M = 3) was lower than baseline, but higher than the baseline generalization probes as well as his initial cue training responding. After we introduced BST, his number of independent contextually appropriate play statements increased (M = 4.7) but continued to be below baseline levels. Additionally, we observed a renewal of challenging behavior during both research sessions and pre-session BST. We ended a session early, during pre-session BST, across two days due to this challenging behavior and decided to end Tom’s participation in this research study. Additionally, while Tom’s engagement with the playsets was high throughout both baselines and initial training conditions, his
engagement decreased during the second cue training condition and BST condition (Table 10).

**Play Statement Types**

Distribution of the type of play statements made in each condition is displayed in Figures 5, 6, 7, and 8 for each of the four participants. These distributions reflect all contextually appropriate play statements made by the participant, independent and prompted. The distributions of play statement types are described for Eddy, Earl, Walt, and Tom below.

**Figure 5**

*Eddy’s Average Frequency of Statement Type*
Earl’s Average Frequency of Statement Type

Figure 7

Walt’s Average Frequency of Statement Type
Figure 8

*Tom’s Average Frequency of Statement Type*

![Bar chart showing average frequency of statement types across conditions](chart.png)

*Note.* 1 = first training and generalization playsets (Tables 2 & 3). 2 = new training and generalization playsets (Table 4).

**Eddy**

Eddy’s distribution of play statement types is presented in Figure 5. Eddy did not make any contextually appropriate play statements during baseline sessions. During training and cue training sessions, all of Eddy’s contextually appropriate play statements were exact statements. Additionally, all of these exact statements were preceded by an echoic prompt. During BST, Eddy almost exclusively used exact statements. However, during session 20, he emitted one mixed statement and one novel statement. Similar to baseline, when the cues were removed Eddy did not make any contextually appropriate play statements. When BST was reintroduced, Eddy only made exact statements.
Earl

Earl’s distribution of play statement types is presented in Figure 6. During baseline, all of Earl’s contextually appropriate play statements were considered novel statements as he had not received any training with the script frames. During training, Earl’s distribution of statement types was only slightly higher for exact statements (M = 9.5) than for novel statements (M = 7.3). After cue training was introduced, Earl’s distribution of statement types differentiated. He primarily emitted exact statements (M = 10.8); though, he did continue to emit some novel statements (M = 5.7). Additionally, during sessions 25 and 26, he made some adapted statements. Interestingly, during cue training, Earl started almost exclusively using one script frame, “I found (object).” After we removed the picture cues, Earl primarily emitted exact statements (M = 25.1) and continued to primarily use the exact script frame “I found (object).” Earl’s number of novel statements continued to decrease (M = 2.75). Earl’s statement type distribution during maintenance check was similar to during the no cue condition, he primarily made exact statements (M = 26.2) and only a few novel statements (M = 2).

Walt

Walt’s distribution of play statement types is presented in Figure 7. Walt did not make any contextually appropriate play statements during baseline sessions. During training and cue training sessions, all of Walt’s contextually appropriate play statements were exact statements. During BST, Walt almost exclusively continued to use exact statements. However, during sessions 33, 34, and 38, he emitted one adapted statement.
He also emitted some novel statements during sessions 39, 43, and 45. Similar to baseline, when the cues were removed Walt did not make any contextually appropriate play statements. When BST was reintroduced, Walt only made exact statements.

**Tom**

Tom’s distribution of play statement types is presented in Figure 8. During baseline, all of Tom’s contextually appropriate play statements were considered novel statements as he had not received any training with the script frames. During training, Tom’s distribution of statement types was slightly higher for exact statements (M = 8.8) than novel statements (M = 5.2). Additionally, during sessions 17 and 19, Tom made one adapted statement. After cue training was introduced, Tom’s distribution of statement types differentiated. He primarily emitted exact statements (M = 9.8) and made fewer novel statements (M = 2). After we doubled the dosage, Tom’s overall distribution remained similar though he was making more contextually appropriate play statements. He primarily emitted exact statements (M = 13.44) as well as emitting some novel statements (M = 4.6). We then “restarted” Tom. During his new baseline, he only emitted novel responses (M = 5.1). After we reintroduced cue training with the new playsets, he primarily made exact statements (M = 10.2) and made fewer novel statements (M = 3). During BST, Tom almost always used exact statements (M = 9.3). Session 56 was the only session during BST that Tom made a novel statement.
CHAPTER V

DISCUSSION

The primary purpose of the current study was to investigate the necessity of using visual aids while teaching preschool-aged autistic children to emit independent contextually appropriate play statements while playing with playsets. All of our participants required the introduction of visual aids, in the form of pictures cues, in order to meet our mastery criteria. While training without visual aids did increase the number of independent contextually appropriate play statements for one participant, Earl, this increase was not sufficient to meet our mastery criteria. All three participants that completed the study met mastery criteria with the aid of picture cues and two participants required the additional aid of attending prompts. Earl met mastery during the cue training condition. Two participants, Eddy and Walt, required pre-session BST in order to meet our mastery criteria. When the cues were removed, Earl continued to make independent contextually appropriate play statements and picture cues were not reintroduced. Conversely, Eddy and Walt’s responding decreased back to baseline levels. When picture cues were reintroduced for Eddy and Walt, their number of independent contextually appropriate play statements returned to mastery level. We also observed that all three participants’ responding generalized to the generalization playsets when the training procedures were implemented with those playsets. We conducted additional generalization probes for Earl after his responding persisted when the cues were removed. Earl also generalized emitting independent contextually appropriate play statements in the absence of the picture cues for the generalization playsets.
The recent study by Mattson et al. (in press) investigated whether or not traditional scripts, that had point-to-point correspondence with the desired vocal response, were necessary and if generic picture cues could be used instead. Our study aimed to further this investigation by determining whether these visual aids were even necessary at all. Our results suggest that these visual aids as well as the attending prompts to interact with them are likely a necessary components in script training and fading procedures, as all of our participants required the introduction of the visual aids and two of the participants required attending prompts throughout research sessions. Additionally, we were able to increase the number of independent contextually appropriate play statements using the same generic picture cues as Mattson et al., providing further evidence that traditional scripts with point-to-point correspondence may not be necessary for some learners. However, our findings were not completely consistent with Mattson et al., in that two of our participants, Eddy and Walt, required pre-session BST with the picture cues in order to meet mastery criteria. Mattson et al.’s participants did not require the use of any pre-teaching or pre-session procedures to see an increase in contextually appropriate play statements. However, pre-teaching scripts is a common component of many script training and fading procedures (see Krantz & McClannahan, 1998, Brodhead et al., 2016, and Groskreutz et al., 2015 for examples). Our findings not only suggest that pre-teaching can be effective with generic picture cues, but that it may also be necessary for some students.

We also investigated the effects of our training procedures on the distribution of types of play statements made by the participant (e.g., exact, adapted, mixed, or novel). We
found that all three participants primarily emitted exact statements during their final training condition. These finding are consistent with one of Mattson et al.’s (in press) participants, Rose. This may be because, in general, our participants’ pattern of responding was most consistent with Rose’s pattern of responding. While Earl emitted novel statements during baseline and initially emitted near equivalent exact and novel statements during training, as he progressed through the cue training his use of novel statements significantly decreased and he began to almost always use the script frame “I found (object).”

**Variability vs Independence**

Throughout this study, we focused on independence rather than variability of contextually appropriate play statements. This focus was reflected in our primary dependent variable, number of independent contextually appropriate play statements, as well as in our mastery criteria, two sessions with two or fewer echoic prompts. We had no requirements for variability of play statements. We observed limited variability for all three participants. While Eddy and Walt consistently used all three taught script frames, they primarily only used those script frames, rarely emitting any novel, mixed, or adapted statements. Interestingly, Earl demonstrated more play statement variability during training without the visual aids than during training with the picture cues. During training without visual aids, Earl engaged in a fairly equivalent distribution of exact and novel play statements. However, his distribution of novel play statements decreased during cue training, and he began almost exclusively using a single training script frame “I found
This suggests that some procedures may be more effective at promoting independence while other are more effective at promoting variability. Future researchers should investigate why some procedures result in more independence while others result in more variability and determine ways to incorporate both procedures when both independence and variability in responding are desirable.

Earl was the only participant who consistently emitted independent contextually appropriate play statements without an attending prompt (Table 9). Earl’s level of independence during cue training meant that he received fewer prompts to engage in the other training script frames. While these data were not captured in our measurement system, Earl often made independent contextually appropriate play statements in response to the research assistant’s behavior (e.g., leaning forward to deliver an attending response). While we hypothesize that Earl’s independent contextually appropriate play statements may have initially increased due to negative reinforcement, avoiding the research assistant’s prompts, Earl’s continued use of the script frame “I found (object)” after the picture cues removed suggests that the play partner’s responding may have also functioned as positive reinforcement. While we cannot draw any firm conclusions from these anecdotal observations, future researchers may want to investigate the role that negative and positive reinforcement play in script training and fading procedures.

Earl was also our only participant to not require pre-session BST. However, as discussed above, due to his independent responding Earl, received fewer prompts with the other two script frames. Implementing the pre-session BST may have been able to better balance Earl’s exposure to all training script frames and we may have seen him use
more variable play statements. Our pre-session BST was similar to the pre-teaching component that is commonly used a part of the script training and fading treatment package (Akers et al., 2016).

**Pre-Teaching Scripts**

Within the script training and fading treatment package, pre-teaching involves teaching the student how to use the textual script prior to the script being embedded within the environment (e.g., attached to items/objects; Akers et al., 2016). While many researchers include this component as part of their script training and fading package, Mattson et al. did not include any pre-teaching with the picture cues. This suggested that pre-teaching may not be a necessary component when using generic picture cues instead of traditional textual scripts. However, our results suggest that pre-teaching may still be necessary with picture cues for some individuals and may be beneficial for others. Eddy and Walt both required pre-session BST to meet our mastery criteria. Our pre-session BST was similar to the previous researchers pre-teaching components in that it focused on increasing exposure to the script frames and requiring independent use of the script frames during a more structure teaching format, rather than the more naturalistic teaching environment during the research sessions. One notable difference between our pre-session BST and previous pre-teaching components was that BST occurred before every session rather than prior to the start of the study. While many pre-teaching components use discrete trial teaching procedures to teach the scripts, BST may also be an effective teaching strategy to use. Future researchers should investigate the use of BST as a
teaching strategy during the pre-teaching component of script training and fading packages. Additionally, future researchers should further investigate the necessity and benefits of incorporating the pre-teaching component with generic picture cues. While two of our participants required pre-session BST, it is unknown how exposure to the training without visual aids condition affected their responding during the initial cue training phase.

**Limitations**

While we were able to answer our primary research question in this study, there are a few notable limitations that warrant further discussion. First, although we were able to successfully teach Earl, Eddy, and Walt to make independent contextually appropriate play statements, Eddy and Walt required the additional support of pre-session BST to meet mastery criteria. Because we only replicated the effects of the pre-session BST across two participants, our findings are somewhat limited. However, our inclusion of the reversal component, no cue condition, and replication of effects when BST was reintroduced for Eddy and Walt does provide additional evidence of the effectiveness of pre-session BST for Eddy and Walt. While Earls results replicate Mattson et al.’s (in press) findings that contextually appropriate play statements can be increased using generic picture cues. Unlike in Mattson et al. where participants’ responding decreased when the picture cues were removed, Earl’s number of contextually appropriate play statements persisted and increased. This may have been due to slight procedural differences between cue training in this study compared to Mattson et al.’s. We restarted
the Motivaider after every independent contextually appropriate play statement emitted by the participant. For Earl, this meant that when he met mastery criteria in the cue training phase, he was already primarily responding without the research assistant delivering any attending prompts.

Another limitation of this study is the variety of training conditions we implemented with participants. All participants experienced at least two different training conditions, training without visual aids and cue training. Eddy and Walt additionally experienced pre-session BST and Tom experienced both pre-session BST and a condition where we doubled the dosage of the cue training. It is possible that the sequential implementation of different training procedures may have affected participant responding in later conditions. In particular, Eddy and Walt’s responding during cue training may have been negatively affected by carryover effects from the previous training condition. The addition of the picture cues and attending prompts may not have been sufficiently salient for them at the beginning. It is possible that had we continued to run them out in that condition or if they had not had the previous exposure to the training with no visual aid condition, that their number of independent contextually appropriate play statements may have increased sufficiently to meet our mastery criteria without the need of pre-session BST. Tom, who experienced the most variety of training procedures may have been the most affected by them. It is possible that his exposure to multiple training procedures convoluted his learning history for making independent contextually appropriate play statements while playing with playsets, negatively affecting his responding in later conditions.
Tom’s overall performance and withdrawal from this study is another limitation. Although Tom’s participation in this study ended due to challenging behavior, he did demonstrate on multiple occasions that he was capable of making independent contextually appropriate play statements. For example, during one of his initial baseline generalization probes, he emitted 16 independent contextually appropriate play statements (more than any of Eddy or Walt’s sessions). Additionally, during one of his training without visual aids sessions, he emitted 12 independent contextually appropriate play statements which is consistent with the number of independent contextually appropriate play statements made by Eddy at mastery. After “restarting” Tom, during baseline sessions 35 and 38 and BST session 54 he emitted 17, 10, and 10 independent contextually appropriate play statements, respectively. However, Tom’s independent responding was inconsistent. It is possible that the social interaction provided within the research sessions was not sufficient to increase and maintain Tom’s independent contextually appropriate play statements. Future researchers should investigate programming in additional reinforcement (e.g., edible reinforcement) for independent contextually appropriate play statements and then fading it out.

Finally, similar to Mattson et al. (in press), we did not attempt to fade the picture cues for Eddy and Walt after we reintroduced them. Previous researchers have found mixed success when fading traditional textual and auditory scripts (Akers et al., 2016). Currently, while there is evidence to support the use of generic picture cues in place of traditional textual scripts, it is unknow whether these visual aids can be successfully faded from the environment. However, before fading of the visual cues themselves is
attempted it may be beneficial to investigate methods for fading attending prompts. While Eddy and Walt made contextually appropriate play statement without the delivery of echoic prompts, almost all of their play statements were preceded by an attending prompt (Table 9).

When considering methods for fading the presence of the picture cue in the environment, we must consider what natural discriminative stimulus (SD) we want to control these vocal responses. Initially, the playsets and their materials themselves seem like the ideal natural SD. However, a critical component to consider when selecting this natural SD is the presence of the play partner. It is the play partner’s presence that signals the availability of social reinforcement, in the form of responding to the comments, for the individual’s contextually appropriate play statements. However, a play partner’s presence while playsets/toys are also present may not always indicate that reinforcement will be available. For example, a caregiver who often responds to play statements may be busy talking on the phone and not available for reinforcement. Thus, a more appropriate natural SD may be the presence of the play partner actively engaged with the playset/toys. A limitation of this study is that during research sessions, our play partner only sat near the participant and did not actively engage with any of the playset materials. We may have observed different results had the play partner been actively engaged with the playset while the participant was playing. Future researchers should investigate the effects that play partner behavior (e.g., interacting with the toys) has on communication during play. Additionally, future researchers can also examine how play partners
behavior affects the success of fading visual supports from the environment, such as picture cues and traditional scripts.

**Conclusions**

Overall, this study begins to provide evidence that the visual aids (e.g., traditional scripts, picture cues) and/or attending prompts used as part of script training and fading packages are an important component of the treatment package. Additionally, this study provides further evidence that generic picture cues can be used instead of traditional scripts to promote independent contextually appropriate play statements. These results are important for informing clinical practice so that we do not attempt to use ineffective procedures, delaying, and potentially inhibiting, acquisition of the desired skill. Providing additional evidence in support of new adaptations, the use of picture cues rather than traditional scripts, is also important for clinicians to be able to successfully engage in evidence-based practice (Slocum et al., 2014). For example, when accessing the literature to select a treatment for their pre-reader client, clinician can consider whether using generic picture cues may be most beneficial for their client. Further, the promotion of language during play is a socially significant area of study and we hope that we can inspire future researchers that read this study to continue investigating this topic as there is still much work to be done and information to discover.
REFERENCES

https://doi.org/10.1007/s40489-015-0062-9


https://doi.org/10.1901/jaba.2011.44-357

https://doi.org/10.1002/jaba.280


APPENDICES
Appendix A

Data Collection Sheet
### Contextually Appropriate Statements Data Sheet

<table>
<thead>
<tr>
<th>Statement</th>
<th>Type</th>
<th>Engage</th>
</tr>
</thead>
<tbody>
<tr>
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| Percent   |               |        |

<table>
<thead>
<tr>
<th>Ind. Statem.</th>
<th>Exact</th>
<th>Adapted</th>
<th>Mixed</th>
<th>Novel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Participant:** ___________________

**Observer:** ____________________

**Date:** ________________________

**IOA:** _________________________

**Session Start Time:** ______________

**Session End Time:** ______________
Appendix B

Play Partner and Research Assistant Training Written Instructions
Baseline Procedures

**Play Partner**
1. Set up research room
   a. Empty of everything but correct playset
2. Start session by saying “Let’s play (playset)”
3. Start 5-minute timer
4. Sit across from the participant
5. Respond to all contextually appropriate play statements/requests
   a. Response should be related to the participants statement/request
6. Respond to unrelated statements/requests by saying “let’s keep playing”
7. When the timer goes off, end the session by saying “we’re done”

**Research Assistant**
1. Sit behind the participant
2. Say nothing

No Visual Aid Training Procedures

**Play Partner**
1. Set up research room
   a. Empty of everything but correct playset
2. Start session by saying “Let’s play (playset)”
3. Start 5-minute timer
4. Sit across from the participant
5. Respond to all contextually appropriate play statements/requests
   a. Response should be related to the participants statement/request
6. Respond to unrelated statements/requests by saying “let’s keep playing”
7. When the timer goes off, end the session by saying “we’re done”

**Research Assistant**
1. Sit behind the participant
2. Set a 20 s timer
   a. If the participant makes a contextually appropriate play statement, reset the time
   b. If the timer goes off:
      i. Provide an echoic prompt for the correct script frame related to the aspect of the playset the participant is engaged with
         1. If the participant is not engaged with the playset, provide a physical prompt to engage with it simultaneously
      ii. Reset the timer
Cue Training Procedures

Play Partner
1. Set up research room
   a. Empty of everything but correct playset
2. Start session by saying “Let’s play (playset)”
3. Start 5-minute timer
4. Sit across from the participant
5. Respond to all contextually appropriate play statements/requests
   a. Response should be related to the participants statement/request
6. Respond to unrelated statements/requests by saying “let’s keep playing”
7. When the timer goes off, end the session by saying “we’re done”

Research Assistant
1. Sit behind the participant
2. Set a 20 s timer
   a. If the participant makes a contextually appropriate play statement, reset the timer
   b. If the timer goes off:
      i. Provide an attending prompt by manually guiding the participant to touch/point to the picture cue
      ii. Following the progressive prompt delay (see below), provide an echoic prompt for the correct script frame if needed
      iii. Reset the timer

Progressive Prompt Delay Procedures
We will used a progressive prompt delay to fade the echoic prompt from the attending prompt.
- The progressive prompt delay will be: 0s, 2s, 4s, …
- Mastery criteria for moving to the next delay is two consecutive sessions with 2 or fewer echoic prompts

Pre-session BST Procedures

BST training materials:
- Picture Cues
- Playset to be used that session
Start the session by saying:
“Hi _______. I’m going to show you how you can use some picture cues that will help you know what you can say while you’re playing. This yellow one means you can say: ‘I’m playing with the ______.’ The red one means you can say: ‘Look at the _____.’ The blue one means you can say: ‘I found the ______.’ Here I’ll show you.”

Demonstrate how to use the yellow picture cue, then have them practice:
- Point to the yellow picture cue and say “I’m playing with the (object).”
- Say: “now you try” and provide an attending prompt to the yellow picture cue

Demonstrate how to use the red picture cue, then have them practice:
- Point to the yellow picture cue and say ‘Look at (object).’
- Say: “now you try” and provide an attending prompt to the red picture cue

Demonstrate how to use the yellow picture cue, then have them practice:
- Point to the blue picture cue and say ‘I found the (object).’
- Say: “now you try” and provide an attending prompt to the blue picture cue

After they have demonstrated independence with each picture cue individually, say: “Okay now let’s practice with all of them.”
- Randomly provide attending prompts to the three different picture cues

**While they are practicing:**
- If they respond correctly
  - respond to their comment with a comment related to theirs and praise
- If they respond incorrectly
  - Say, remember the (color) picture cue mean you say (script frame), like this
  - Prompt them to engage in the correct response
  - Give them another chance
  - Continue until they independently respond correctly
Appendix C

Treatment Integrity Data Sheets
**Play Partner Treatment Integrity Data Sheet**

No Visual Aids

<table>
<thead>
<tr>
<th>Participant: ___________________</th>
<th>Session #: ________________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observer: ______________________</td>
<td>IOA: ______________________</td>
</tr>
<tr>
<td>Play Partner: _________________</td>
<td>Researcher: ________________</td>
</tr>
</tbody>
</table>

**Directions:** Mark a ‘1’ if the play partner correctly completed each component.

<table>
<thead>
<tr>
<th>Integrity Items</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevant play set present and set up</td>
<td></td>
</tr>
<tr>
<td>Began the session by providing the instructions, “Time to play ____.”</td>
<td></td>
</tr>
<tr>
<td>Positioned across from/next to participant</td>
<td></td>
</tr>
<tr>
<td><strong>Play partner responded to play comments that met the definition</strong></td>
<td></td>
</tr>
<tr>
<td>Redirected unrelated statement and requests</td>
<td></td>
</tr>
<tr>
<td>Did not ask questions or give directions</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Correct:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Opportunities:</td>
<td></td>
</tr>
<tr>
<td>Percentage:</td>
<td></td>
</tr>
</tbody>
</table>
# Play Partner Treatment Integrity Data Sheet

**Picture Cues**

<table>
<thead>
<tr>
<th>Participant: ___________________</th>
<th>Session #: ___________________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observer: ____________________</td>
<td>IOA: ______________________</td>
</tr>
<tr>
<td>Play Partner: _________________</td>
<td>Researcher: ________________</td>
</tr>
</tbody>
</table>

**Directions:** Mark a ’1’ if the play partner correctly completed each component.

<table>
<thead>
<tr>
<th>Integrity Items</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevant play set present and set up</td>
<td></td>
</tr>
<tr>
<td>Picture cue materials set up on the correct parts of the toy</td>
<td></td>
</tr>
<tr>
<td>Positioned across from/next to participant</td>
<td></td>
</tr>
<tr>
<td>Began the session by providing the instructions, “Time to play____.”</td>
<td></td>
</tr>
<tr>
<td>Play partner responded to play comments that met the definition</td>
<td></td>
</tr>
</tbody>
</table>

- Redirected unrelated statement and requests
- Did not ask questions or give directions

<table>
<thead>
<tr>
<th>Total Correct:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Opportunities:</td>
<td></td>
</tr>
<tr>
<td>Percentage:</td>
<td></td>
</tr>
</tbody>
</table>
## Research Assistant Treatment Integrity Data Sheet

**No Visual Aids**

- Participant: __________________
- Observer: __________________
- Play Partner: _______________
- Session #: __________________
- IOA: __________________
- Researcher: _______________

**Directions:** Mark a '1' if the research assistant correctly completed each component.

<table>
<thead>
<tr>
<th>Integrity Items</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positioned near (behind/side) the participant</td>
<td></td>
</tr>
<tr>
<td>Prompting- Statement</td>
<td>Echoic</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not ask questions or give directions</td>
<td>Total Correct:</td>
</tr>
<tr>
<td></td>
<td>Total Opportunities:</td>
</tr>
<tr>
<td></td>
<td>Percentage:</td>
</tr>
</tbody>
</table>
### Research Assistant Treatment Integrity Data Sheet

**Picture Cues**

<table>
<thead>
<tr>
<th>Participant:</th>
<th>Session #:</th>
</tr>
</thead>
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</tr>
<tr>
<td>Play Partner:</td>
<td>Researcher:</td>
</tr>
</tbody>
</table>

**Directions:** Mark a '1' if the research assistant correctly completed each component.

<table>
<thead>
<tr>
<th>Integrity Items</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positioned near (behind/side) the participant</td>
<td></td>
</tr>
<tr>
<td>Prompting- Statement</td>
<td>Attending</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Did not ask questions or give directions

<table>
<thead>
<tr>
<th></th>
<th>Total Correct:</th>
<th>Total Opportunities:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Percentage:</td>
</tr>
</tbody>
</table>
### BST Treatment Integrity Data Sheet

**Participant:** _______________   **Session #:** _______________

**Observer:** _______________   **IOA:** _______________

**Play Partner:** _______________   **Researcher:** _______________

**Directions:** Mark a '1' if the research assistant correctly completed each component.

<table>
<thead>
<tr>
<th>Integrity Items</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevant play set present and set up</td>
<td></td>
</tr>
<tr>
<td>Picture cue materials set up on the correct parts of the toy</td>
<td></td>
</tr>
<tr>
<td>Started by describing the purpose and meaning of the picture cues</td>
<td></td>
</tr>
<tr>
<td>Provided a model of how to use the yellow picture cue</td>
<td></td>
</tr>
<tr>
<td>Gave the participant an opportunity to use the yellow picture cue</td>
<td></td>
</tr>
<tr>
<td>Provided a model of how to use the red picture cue</td>
<td></td>
</tr>
<tr>
<td>Gave the participant an opportunity to use the red picture cue</td>
<td></td>
</tr>
<tr>
<td>Provided a model of how to use the blue picture cue</td>
<td></td>
</tr>
<tr>
<td>Gave the participant an opportunity to use the blue picture cue</td>
<td></td>
</tr>
<tr>
<td>Had the participant practice with all the picture cues, randomly</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Correct:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Opportunities:</td>
<td></td>
</tr>
<tr>
<td>Percentage:</td>
<td></td>
</tr>
</tbody>
</table>
CURRICULUM VITAE

Beverly Nichols, M.S., BCBA, LBA-UT

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(805) 750-3732
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EDUCATION

Utah State University (USU), Logan, UT
Ph.D., Disability Disciplines with a specialization in Applied Behavior Analysis, expected May 2023
Advisor: Thomas S. Higbee, Ph.D., BCBA-D, LBA
Dissertation: Teaching Contextually Appropriate Play Commenting Without the Use of Visual Cues

California State University, Northridge (CSUN), Northridge, CA
M.S., Applied Behavior Analysis with distinction, August, 2018
Advisors: Debra Berry Malmberg, Ph.D., BCBA-D, Licensed Psychologist & Megan Aclan, Ph. D., BCBA-D
Received Outstanding Achievement Award

California State University, Channel Islands, Camarillo,
B.A., Sociology, emphasis on social institutions, May, 2011
Alpha Kappa Delta International Honor Society

Ventura Community College, Ventura, CA
A.A, Liberal Arts, July, 2009
Dean’s List: Fall 2006, Fall 2007, Fall 2008, Spring 2009

PROFESSIONAL CERTIFICATIONS AND LICENSURE

2018 – Present  Board Certified Behavior Analyst (BCBA), 1-18-33969

2021 – Present  State of Utah, Licensed Behavior Analyst, 12529456-2506

PUBLICATIONS


PUBLICATIONS UNDER REVIEW


PUBLICATIONS IN PREPARATION

RESEARCH IN PROGRESS

PROFESSIONAL PRESENTATIONS


**SYMPOSIA CHAIRED AT PROFESSIONAL CONFERENCES**


**UNIVERSITY TEACHING**

**Utah State University**

- **Fall 2022**
  
  **Course:** SPED 5012- Applied Behavior Analysis I: Principles, Assessment, and Analysis  
  **Type:** Blended asynchronous/synchronous distance course  
  **Role:** Co-Instructor

- **Fall 2021**
  
  **Course:** SPED 5012- Applied Behavior Analysis I: Principles, Assessment, and Analysis  
  **Type:** Blended asynchronous/synchronous distance course  
  **Role:** Co-Instructor

- **Fall 2020**
  
  **Course:** SPED 5010- Applied Behavior Analysis I: Principles, Assessment, and Analysis  
  **Type:** Synchronous distance course  
  **Role:** Teaching Assistant

- **Fall 2019**
  
  **Course:** SPED 5010- Applied Behavior Analysis I: Principles, Assessment, and Analysis  
  **Type:** In-Person course  
  **Role:** Teaching Assistant

**California State University, Northridge**

- **Spring 2018**
  
  **Course:** PSY 557- Behavior Change Procedures and Support Systems  
  **Type:** In-Person course  
  **Role:** Teaching Assistant

- **Spring 2018**
  
  **Course:** PSY 555- Assessment in Applied Behavior Analysis  
  **Type:** In-Person course  
  **Role:** Teaching Assistant

**OTHER PRESENTATIONS AND TRAININGS**

Aguilar, J. & Nichols, B. (2019, November) Introduction to autism and applied behavior analysis. Presentation for SPED 4000 Education of Students with Disabilities, Kimberly Snow; Logan, UT.


TRAINING PROJECTS
2019 - present  Project: Utah Regional Leadership Education in Neurodevelopmental Disabilities (URLEND)
   Role: ABA Trainer and Consultant
   Location: Autism Support Services: Education, Research, and Training (ASSERT), Logan, UT
   Description: URLEND is a collaborative, multi-disciplinary training program for professionals to increase knowledge and skills in providing services to individuals with neurodevelopmental disabilities. I provide training and support on ABA principles and instructional techniques to graduate-level professionals from a variety of disciplines including speech-language pathology, psychology, early childhood education, and special education.

CLINICAL EXPERIENCE
2019 – Present  BCBA
   Autism Support Services: Education Research, and Training (ASSERT)
   Logan, UT

2020  ABA Consultant
   Granite School District
   Salt Lake City, UT

2016 – 2018  Graduate Research Assistant
   CSUN Autism Clinic
   Northridge, CA

2014 – 2017  Behavioral Therapist
   Autism Learning Partners
   Los Angeles and Ventura County, CA

ORGANIZATIONAL SERVICE
2020 - present  Curriculum Development Team, Autism Support Services: Education, Research, and Training (ASSERT)


2016 - 2018  Undergraduate Research Assistant Coordinator, CSUN Autism Clinic

PROFESSIONAL MEMBERSHIPS
2016 - 2019, 2022 - 2023  California Association for Behavior Analysis (CalABA)
2017 - Present  Association for Behavior Analysis International (ABAI)
2019 - Present  Utah Association for Behavior Analysis (UtABA)