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Using Generic Picture Cues to Promote Verbal Initiations During Play

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USING GENERIC PICTURE CUES TO PROMOTE VERBAL INITIATIONS DURING PLAY

by

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ABSTRACT

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Children with autism spectrum disorder (ASD) often demonstrate difficulty communicating with others, and this may impact the extent to which they can engage in contextually appropriate language during play. Previous researchers have used social script training interventions to increase commenting during play with caregivers, siblings, and adult play partners. In these previous studies, researchers have taught participants to use text-based or audio recorded scripts with point-to-point correspondence with trained scripted statements. However, because social script training interventions are multi-component interventions that include physical and verbal prompting strategies in addition to the textual or auditory script, it is unclear the extent to which the specific words associated with the scripts are necessary to evoke responding. Therefore, the purpose of this study was to examine the effects of a script training intervention using script frames and generic picture cues on the number of contextually appropriate play-based statements for children with ASD. We also examined the extent to which responding generalized to

novel toy sets and provided an analysis of the types of play comments participants emitted. Three participants demonstrated a higher number of contextually appropriate play statements in the training condition as compared to the baseline and no cue conditions. Further, two out of three participants continued to emit a similar number of contextually appropriate play statements when we introduced novel toy sets. We also found that all participants emitted a variety of different play statement types. Potential limitations and future research related to using generic picture cues to promote verbal initiations for children with ASD are discussed.

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PUBLIC ABSTRACT

Using Generic Picture Cues to Promote Verbal Initiations During Play

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Children with autism spectrum disorder (ASD) often demonstrate difficulty communicating with others, and this may impact the extent to which they can engage in language during play. Previous researchers have used interventions to increase commenting during play with caregivers, siblings, and adult play partners. In these previous studies, researchers have taught participants to use text-based or audio recorded scripted phrases to facilitate communication. However, because these interventions include multiple components such as physical guidance and verbal reminders from another individual in addition to the textual or auditory scripted phrase, it is unclear the extent to which the specific words associated with the scripted phrases are necessary to evoke responding. Therefore, the purpose of this study was to examine the effects of an intervention using generic picture cues on the number of play-based statements for children with ASD. We also examined the extent to which participants engaged in play statements when the cues were attached to novel toy sets and provided an analysis of the types of play statements participants emitted. Three participants engaged in more play-based communication in the training condition as compared to the baseline and no cue conditions. Further, two out of three participants continued to engaged in play-based communication when we introduced novel toy sets. We also found that all participants emitted a variety of different play statements. Potential limitations and future research

related to using generic picture cues to promote communication during play for children with ASD are discussed.

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CHAPTER I

INTRODUCTION

Play is an important part of child development and early childhood experts have highlighted the cognitive, social, and emotional benefits of engaging in play (Copple & Bredekamp, 2009). In early childhood, children engage in object play and, through engaging in social communication in this context, children expand their communication repertoires (Bloom, 1993). Thus, in order to fully access the social benefits of engaging in play, children must also engage in contextually appropriate language during play. This language may include direct initiations and responses between the child and a play partner, or other contextually appropriate play statements such as comments about play materials or play actions (Akers, Higbee, Pollard, et al., 2018).

Although play-based communication is an important part of child development, children with autism spectrum disorder (ASD) may struggle to engage in meaningful language during play. In fact, challenges in this area are part of the diagnostic criteria for ASD. According to the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5), ASD is characterized by challenges in social functioning and communication, and the presence of stereotypic, rigid, or repetitive behaviors (American Psychiatric Association [APA], 2013). As a result, many children with ASD have difficulty engaging in contextually appropriate play-based communication (Warren et al., 2010). The characteristics described above can influence how children with ASD engage in social initiations, social responses, and contextually appropriate commenting. Because children learn to engage in communication through play (Bloom, 1993), the inability to

communicate in this context may limit the extent to which children with ASD can expand their language repertoires. However, adults and other children in the environment frequently engage in language in a play context. Thus, if a child with ASD has a limited communication repertoire, they may not be able to participate in these activities in a meaningful way, which may impact their ability to develop relationships with teachers, siblings, or peers.

Because of the importance of language during play, researchers have investigated behavior analytic strategies to teach children with disabilities to engage in appropriate communication in this context. For example, in order to improve sociodramatic play for children with language delays, Goldstein et al. (1988) trained children to enact situation-based "scripts" that included motor, gestural, and verbal responses for three different roles in a single play scenario. In one experiment, the researchers trained two triads (one child with a language delay and two typically developing children) to enact a "hamburger stand" script. Teachers used instructions, modeling, rehearsal, and feedback to train participants to enact the script roles during 15-min lessons. Although some participants' social responding improved after the training as compared to baseline, researchers had to incorporate role prompting, where the teacher prompted the children to stay in their roles.

In a second experiment, Goldstein et al. (1988) replicated the procedures from the first experiment but included all participants with a language delay and trained the participants to enact a "barber shop" script. Participants engaged in more social responding in the role prompting conditions as compared to the no role prompting conditions. Overall, the researchers found that while the participants were able to learn

the scripted scenario following explicit training, it was still necessary for the teacher to provide prompting and reminders for the children to act out their roles.

Although Goldstein et al. (1988) demonstrated that it may be feasible to provide training and adult prompts to facilitate child play and play-based language for children with a language delay, some researchers have noted that children with ASD may respond more consistently to pictorial or written stimuli (MacDuff et al., 1993). Further, if play-based behaviors and language are evoked by visual stimuli, there may be less need for continuous prompting from a caregiver, interventionist, or other individual in the environment. Because of the potential benefits of using pictorial or written stimuli to promote social responding during play situations, researchers have developed interventions that include these types of stimuli. Activity schedules, which include pictorial and/or written stimuli to cue a sequence of responding (MacDuff et al., 1993), represent one example of this type of intervention. Script training and fading procedures, where researchers use physical prompting, graduated guidance, and vocal prompting of the scripted statement to transfer stimulus control from adult prompts to a textual or auditory script (Akers et al., 2016), represent another example of this type of intervention. Because of the advantages described above, both intervention strategies have been used to facilitate language and play behavior in children with ASD.

Activity Schedules

Activity schedules, defined as a "set of pictures or words that cue a person to engage in a sequence of activities" (McClannahan & Krantz, 1999, p. 3) have been used

to facilitate independent performance across a variety of learners, behaviors, and settings (Koyama & Wang, 2011). Activity schedule interventions may be particularly useful because once the child learns to manage the schedule, responding is evoked by pictorial and/or written stimuli in the schedule and no longer requires the presence of an adult prompter. Researchers have implemented activity schedules to increase on-task behavior (Bryan & Gast, 2000; MacDuff et al., 1993), facilitate independent transitions (J. M. Pierce et al., 2013), improve daily living skills (K. L. Pierce & Schreibman, 1994), and promote social initiations and exchanges (Krantz et al., 1993). Recently, researchers have also used peer-based activity schedules to promote social responding in a play context. One such schedule is the joint activity schedule, which is an activity schedule with two or more participants who follow one schedule to complete a common goal. For example, Betz et al. (2008) implemented a joint activity schedule intervention to facilitate joint engagement during game-play. Another type of cooperative activity schedule is the linked activity schedule, where two or more participants follow individual schedules with linked roles to complete a common goal. Linked activity schedules have been used to teach children with ASD to participate in a hide and seek game (Brodhead et al., 2014), to participate in hide and seek with typically developing peers (Akers, Higbee, Gerencser, et al., 2018), and complex sociodramatic play with typically developing peers (Pellegrino, 2018).

Script Training and Fading

Social script training and fading interventions are additional strategies researchers

have used to increase social communication for children with ASD (Akers et al., 2016; Krantz & McClannahan, 1993; Topuz & Ulke-Kurkcuoglu, 2021). Scripts function as cues for children to emit specifically trained words or phrases, and they are commonly implemented in specific contexts such as during snack or play. During social script training, interventionists use a combination of training procedures such as physical prompting, graduated guidance, and vocal prompting of the scripted statement to transfer stimulus control from adult prompts to the script (Akers et al., 2016). After participants learn to reliably emit scripted phrases, many researchers conduct script fading to fade the support of the scripted cue. During script fading, researchers systematically fade scripts by implementing a series of fading steps. Scripts are generally faded back to front (beginning with the last word of the script and continuing to the first word). However specific fading steps, the terminal fading step, and the extent to which researchers have successfully faded scripts fully have varied across participants and studies (Akers et al., 2016).

One distinct benefit to script training interventions is that after initial training, language is evoked by the script, reducing the need for continuous prompting from an adult in the environment. This is advantageous for a couple of reasons. First, continuous prompting from an adult may be unnatural and stigmatizing in social situations. Additionally, in many instructional settings in which children with ASD participate (e.g., school classrooms, clinical settings, home, etc.), there may not be sufficient resources for adults to provide continuous prompting to engage in social responding.

Due to the utility of script training and fading interventions, researchers have

applied these procedures to a variety of social communication behaviors in multiple contexts. Specifically, researchers have evaluated the effects of script training and fading on bids for joint attention (MacDuff et al., 2007), social initiations and responses (Wichnick et al., 2010a), varied manding (e.g., Betz et al., 2011; Brodhead et al., 2016; Sellers et al., 2016), and play-based commenting (e.g., Akers, Higbee, Pollard, et al., 2018; Reagon & Higbee, 2009). Because skill repertoires vary widely across individuals who could benefit from script training, researchers have also used multiple script formats including textual and auditory scripts.

To implement textual script training and fading, researchers create scripts that include written words (e.g., Brown et al., 2008). After participants learn to read the scripts, researchers traditionally fade the scripts from back to front, removing one word at a time. To implement auditory script training and fading, researchers create scripts using auditory recording devices such as computer recordings (e.g., Howlett et al., 2011) or miniature auditory buttons (e.g., Betz et al., 2011). Throughout training, participants imitate the scripted phrase from the auditory device. Similar to textual scripts, auditory scripts are generally faded back to front, removing one word from the recorded scripted phrase at a time.

The current literature including script training and fading interventions indicates that these textual and auditory script training strategies are effective for promoting contextually appropriate language for children with ASD. However, researchers use additional training procedures to teach children with ASD to use scripts (e.g., physical, gestural, and verbal prompting strategies), and scripts are typically tied to visual stimuli

(e.g., Pollard et al., 2012), trained with play sets (e.g., Akers, Higbee, Pollard, et al., 2018; Reagon & Higbee, 2009), or trained as script frames (e.g., Groskreutz et al., 2015). As a result, it is unclear the extent to which the specific words associated with the scripts are necessary to evoke responding. Further, although the textual and auditory script formats commonly used have been effective, there may be some limitations to using these approaches. For example, many individuals who could benefit from script training interventions do not have a well-developed reading repertoire, but the auditory statements emitted by auditory scripts may be unnatural and stigmatizing in some social contexts. Beyond these considerations, researchers have demonstrated there is variability in the extent to which they can fade scripts completely for all participants. Therefore, there may be a need to investigate script training formats that can be used to promote contextually appropriate commenting for children with ASD during play. As described above, previous researchers have trained learners to use scripts using physical prompting, graduated guidance, and vocal prompting procedures. Further, scripts are often trained in the presence of additional environmental stimuli. As a result, the extent to which the words associated with scripts are necessary is unknown, and it may be feasible to tie scripted statements to a more generic visual cue.

If researchers can tie scripted statements to a generic visual cue, this approach may have several advantages. For example, it may be difficult in clinical settings for interventionists to find the time to create and manage comment-specific textual or auditory scripting materials. Further, researchers have had varying levels of success with fading scripts completely across all learners. Thus, it may be beneficial to evaluate the

effects of tying scripted statements to a generic visual cue that could be used across stimuli and materials. In order to examine the strengths and weaknesses of existing script training and fading methods, I conducted a review of the existing literature on this topic.

CHAPTER II

LITERATURE REVIEW

In order to better understand the use of script training and fading procedures to promote contextually appropriate communication, I conducted a formal literature review on script training and fading procedures using PsycINFO via EBSCOhost. I used the following search stream: "script training" OR "script fading" OR "social script" OR "visual script." This search yielded 129 results, and after narrowing to peer-reviewed articles, this left 97 results. After removing duplicates and articles related to script training for aphasia, there were 44 results. I conducted an Abstract and full text screening of these articles to determine if they met the inclusion criteria. Each included article had to (a) be a peer-reviewed article, (b) measure a dependent variable consistently over time, (c) include a textual or auditory script training intervention, and (d) include child participants (participants between the ages of 2-12). After applying the inclusion criteria, I had 15 articles to review. In order to capture articles that were not included in my initial search, I conducted an ancestral search of Akers et al. (2016) and a descendant search of Krantz and McClannahan (1993). This search resulted in one additional article to review for a total of 16 articles.

Below, we provide a review of each of the 16 total articles that met the inclusion criteria for this literature review. First, we included a review of the seminal script training and fading study (Krantz & McClannahan, 1993). We categorized the remaining 15 studies into sections based on the dependent variable and goal of the script training intervention. Thus, the studies are categorized based on using script training and fading

procedures to increase: (a) bids for joint attention, (b) social initiations and responses, (c) manding for information, (d) varied manding, and (e) play-based commenting. We chose to provide information about the manding and play-based commenting studies towards the end of the literature review because the procedures and limitations of these studies directly informed the development of the current investigation.

Initial Script Training

There are several potential limitations to including adult prompting in social situations. For example, children may rely on the prompt to engage in social communication instead of attending to relevant environmental cues. Further, adult prompting may be stigmatizing in social situations. Because of these limitations, researchers recognized the need for procedures that transfer stimulus control from adult prompters to other existing features of the environment. Krantz and McClannahan (1993) posited that textual scripts may be a useful support to increase initiations in social communication contexts for children with ASD. The purpose of this study was to assess the effects of a script training and fading procedure on social initiations of children with ASD. Four participants (ages 9-12) in a day school and intervention program participated in this study. The researchers measured scripted and unscripted initiations to peers, defined as understandable statements or questions directed towards another child and not prompted by an adult. Specifically, researchers defined scripted initiations as initiations that matched the written script except for conjunctions, articles, prepositions, or pronouns. Unscripted initiations were defined as initiations that differed from the scripted

statements by more than conjunctions, articles, prepositions, or pronouns.

Krantz and McClannahan (1993) employed a multiple baseline across participants design that included baseline, script, follow-up, and generalization conditions. During the baseline condition, the teacher provided participants with a single sheet of paper that included written instructions to, “Do your art” and “Talk a lot.” After the participants read the instructions, the teacher moved away from the participants and only interacted with them if they asked questions. During the script condition, the teacher continued to present the sheet with the baseline instructions, but the sheet also included 10 scripted statements and questions about previous activities, future activities, or objects in the environment. To train participants to use the scripts, the teacher used manual guidance to prompt the participant to pick up the pencil, point at the script, and move the pencil below the text. If the participant did not vocalize the script within 5 s, the teacher repeated the manual guidance prompt. The researchers faded manual prompts and after the manual guidance procedures were faded for a participant, script fading began. Researchers faded scripts from end to beginning and script fading included five steps. During the generalization sessions, researchers conducted sessions in a different setting with a different teacher at a different time of day and with a different activity. In order to gather normative data, the researchers also measured initiations made by typically developing peers under the baseline conditions participants were exposed to. Finally, researchers conducted a 2-month follow-up condition. During follow-up, participants used the scripts faded to one pair of quotation marks.

The results of this study indicated that all participants engaged in more initiations

during the script condition as compared to the baseline condition. In the first three generalization conditions, the participants made few initiations. However, when the researchers reintroduced a faded script, initiations increased for all participants. At the 2-month follow up, three out of four participants maintained levels of initiations. One participant did not engage in as many initiations, but his initiations were still higher than his initiations during baseline.

Overall, Krantz and McClannahan (1993) demonstrated the efficacy of using a script training and fading procedure to increase initiations for children with ASD. Researchers also noted that although there were 10 scripted statements, participants commonly engaged in more than 10 initiations per session. This indicates that participants engaged in both scripted and unscripted initiations following script training. Further, participants were able to engage in initiations with peers in a completely different generalization context with minimal support from scripts (e.g., only one set of quotation marks). Finally, researchers noted that, based on their observation of typically developing children under baseline conditions, participants engaged in appropriate language at the same level as typically developing peers.

Although results of this study indicated that script training and fading procedures increased initiations for four children with ASD, researchers were not able to fade the scripts completely. In fact, researchers had to keep the quotation marks as a prompt for participants to engage in initiations. Additionally, researchers did not specifically measure quality or complexity of language, so it is difficult to know the extent to which script training produced better quality language.

Bids for Joint Attention

Researchers have also investigated the effects of scripts and script fading on bids for joint attention. For example, MacDuff et al. (2007) implemented an auditory script fading intervention to teach three preschool children with ASD to make bids for joint attention when they saw stimuli in the environment. The study was conducted in two hallways (training sessions) and a third hallway and conference room (generalization sessions). The researchers measured scripted and unscripted verbal bids for joint attention and pointing responses. MacDuff et al. evaluated the effects of the script training intervention using a multiple probe across participants design that included baseline, teaching, generalization, and maintenance conditions.

During all sessions, the instructor and interaction partner took the participant to the end of the hallway or conference room and provided the instructions, “Let’s walk this way.” During the baseline condition, the instructor did not provide any prompts, but did provide token reinforcement for appropriate walking. During the teaching condition, researchers placed auditory script recorders programmed with the word “see” on 12 stimuli in the environment. If a participant attempted to walk past one of the stimuli, the instructor used manual guidance to prompt the child to press the button to play the script. If the child did not emit the script, the instructor prompted him to touch the button again. During training, the instructor provided tokens when participants engaged in prompted bids for joint attention and special snacks for independent bids for joint attention. Script fading began when the participant engaged in independent bids for joint attention for 11 out of 12 stimuli. Researchers conducted fading by removing the word from the auditory

script recorder, then removing the recorders from all of the stimuli. During the second step, researchers also faded the special snacks that had been previously provided for engaging in independent responding. One participant's bids for joint attention decreased after the second fading step. As a result, researchers conducted a more extensive fading process that involved systematically removing the recorders from some of the stimuli until there were no recorders present. Throughout the teaching condition, researchers conducted generalization probes in a different setting with stimuli that had never been associated with the teaching procedures. After script fading, MacDuff et al. (2007) conducted a maintenance condition with the same procedures as baseline.

During the baseline condition, participants engaged in little to no bids for joint attention. After the introduction of the script fading intervention, bids for joint attention increased across all participants. Additionally, all participants engaged in more bids for joint attention during training generalization probes as compared to baseline generalization probes. Bids for joint attention also maintained at treatment levels during the maintenance condition.

Overall, this study established scripts and script fading as an effective procedure for training children with ASD to make bids for joint attention. Interestingly, when the auditory script recorders were removed, participants consistently engaged in more bids for joint attention than the number of stimuli present. This indicates that the script fading intervention also promoted unscripted language for the participants in the study.

In an extension of MacDuff et al. (2007), Pollard et al. (2012) investigated the effects of a textual script training and fading intervention on bids for joint attention for

children with ASD. This study included two participants who attended a university-based preschool for children with ASD and one participant who attended a public-school classroom. Researchers measured scripted and unscripted independent bids for joint attention. Pollard et al. (2012) evaluated the effects of the intervention using a multiple baseline across participants design that included baseline, teaching, adult scripted responses, multiple-script training, and generalization and maintenance conditions.

Teaching sessions were conducted in a hallway with generalization sessions conducted in a different hallway or another classroom in the school. During all sessions, researchers selected stimuli to set up in various locations along the hall or classroom. All sessions began when the adult conversation partner said, “Let’s take a walk.” During the baseline condition, the conversation partner did not provide any prompts. In the teaching condition, researchers attached printed scripts (“Look, it’s a ____.”) to all of the stimuli. Researchers used physical prompting to prompt the participant to orient to the object, point to the script, and orient to the adult. If the participant did not emit the script within 2 s, the researchers vocally prompted the participant to emit the script. For two participants (Jillian and Drew), researchers implemented an error correction procedure that involved prompting the participant to reorient to the object and completing the bid for joint attention without errors. When participants could emit the script for 90% of stimuli across two sessions or 100% of stimuli for one session, researchers began script fading. Scripts were faded back to front with the final step being no scripts attached to the stimuli.

In order to gain information about whether adult language models would increase

unscripted bids for joint attention, Pollard et al. (2012) implemented an adult scripted responses condition. In this condition, procedures were the same as the teaching condition, but adults responded to bids for joint attention by providing a response that included information about the feature, function, or class of the particular stimulus. Pollard et al. also implemented a multiple-script training condition to determine if training multiple scripts would increase unscripted bids for joint attention. In this condition, researchers included scripts that could be used across several different stimuli. The procedures were the same as the teaching phase, but instead of fading the scripts, researchers conducted periodic probes without scripts. During these probes, session procedures were the same as baseline except the researchers continued to implement the error correction procedures from the teaching condition. Finally, researchers conducted generalization and maintenance probes. Researchers measured generalization to untrained stimuli, new conversation partners, and natural environment stimuli that occurred in the classroom and untrained hallways. Procedures were the same as baseline with the exception of an error correction procedure that was included in the natural environment generalization probes. Maintenance probes were conducted 6 weeks after training and procedures were the same as the generalization probes.

During baseline, participants engaged in few to no bids for joint attention. In the teaching condition, all participants learned to engaged in independent bids for joint attention and maintained these levels of independent bids for joint attention in the adult scripted responses and multiple-script training conditions. Results also indicated increases in unscripted language for two participants (Jillian and Drew) during training.

During the adult scripted responses condition, Jillian and Drew engaged in slightly increased levels of unscripted bids for joint attention. The third participant's unscripted bids for joint attention increased significantly during this condition. When researchers reintroduced multiple scripts in the multiple-script training condition Kevin's unscripted bids for joint attention decreased while responding remained stable for the remaining two participants. All participants engaged in more bids for joint attention during generalization probes to novel conversation partners and novel stimuli in the adult scripted response and multiple-script training phases as compared to baseline. Further, unscripted bids for joint attention increased for two participants (Kevin and Drew) in the natural environment generalization probes in the adult scripted responses phase. For the remaining participant (Jillian), bids for joint attention did not increase during the natural environment generalization probes until the multiple-scripts phase. Only one participant (Jillian) maintained treatment levels of unscripted bids for joint attention during the 6-week follow-up. At this point, researchers conducted additional modeling for Kevin and booster sessions for Drew.

Overall, Pollard et al. (2012) extended the results of MacDuff et al. (2007) by demonstrating the utility of a script training and fading intervention for promoting bids for joint attention for children with ASD. Although the script training intervention was effective, Pollard et al. noted an important limitation. During this study, unscripted bids for joint attention were scored even if participants used variations of the same phrase. Therefore, it was not possible to ascertain whether the participants engaged in responses that were rote and repetitive.

In a recent investigation of using script training and fading to promote bids for joint attention, Gomes et al. (2020) used an intervention package that included auditory script fading, multiple exemplar training, and strategies to program for stimulus generalization to train four children with ASD to engage in bids for joint attention. In this study, researchers included stimuli from the following categories: novel toys, objects that were unusually arranged, large pictures, and auditory sounds. Three categories were assigned to a participant as training categories and the remaining category was reserved for generalization. Gomes et al. measured percentage of trials with correctly initiated bids for joint attention. A bid for joint attention included orienting/pointing towards a stimulus, orienting towards the conversation partner, emitting a vocalization, and orienting back to the stimulus. Researchers also categorized bids for joint attention into scripted, unscripted, and novel initiations.

Gomes et al. (2020) evaluated the effects of the intervention using a multiple baseline across participants design with a multiple probe procedure. Across all conditions, sessions began when the researcher said, "Come with me." Researchers placed 16 stimuli in multiple locations (e.g., classroom, hallways, etc.). In the baseline condition, researchers did not include any scripts, physical guidance, or additional reinforcement for engaging in a bid for joint attention. However, if the child did engage in a bid for joint attention, the conversation partner responded to the bid. During the intervention condition, Gomes et al. added auditory scripts, physical prompting, and tangible reinforcers for engaging in bids for joint attention for two out of the four participants. During intervention sessions, if a participant walked past visual stimuli

without engaging in a bid for joint attention or did not respond to an auditory stimulus for 5 s, researchers implemented an error correction procedure. For visual stimuli, the researcher physically prompted the participant to point to the stimulus, orient towards the experiment, and orient back to the target stimulus. For auditory stimuli, if the participant did not initiate a bid for joint attention, the researchers physically guided the participant to orient away from the activity they were working on and orient towards the researcher. After participants initiated 10/12 bids for joint attention, researchers began script fading. Auditory scripts were faded from end to beginning with the last step being that the voice recorder was no longer activated. After script fading, the researchers conducted reinforcement thinning for two participants until they no longer needed tangible reinforcement for engaging in a bid for joint attention. Throughout the study conditions, Gomes et al. also conducted ongoing generalization probe trials with a stimulus category that had never been associated with teaching procedures. Procedures for generalization probe trials were the same as the procedures for the baseline condition. After participants engaged in bids for joint attention for ten out of twelve stimuli without scripts or extra reinforcement, researchers conducted maintenance trials. Gomes et al. also conducted follow-up sessions at 1, 2, 4, and 6 months. Procedures for maintenance and follow-up conditions were the same as the baseline condition.

In addition to implementing and measuring the effects of the script training intervention, researchers conducted pre- and postintervention sessions to assess generalization to a novel setting. Researchers also measured social validity by showing baseline and treatment clips to undergraduate students and asking in which clips

participants engaged in a bid for joint attention. Finally, Gomes et al. (2020) provided data collectors and instructors with a social validity survey and asked them to rate their satisfaction with the procedures.

In the baseline condition, participants rarely engaged in bids for joint attention with training or generalization category stimuli. After the researchers introduced the intervention, bids for joint attention systematically increased for all participants. These increases remained high during the maintenance and follow-up conditions. For the generalization trials, participants independent bids for joint attention were variable. However, overall bids for joint attention were higher after introduction of the intervention than during the baseline condition. When training began, participants engaged in a combination of scripted, unscripted, and novel comments. As training continued, participants began to engage in more unscripted bids for joint attention and most bids in the maintenance and follow-up conditions were unscripted. Further, all participants engaged in more bids for joint attention during the post-intervention probes, observers were able to identify sessions where children engaged in joint attention, and implementers indicated that they found the intervention acceptable.

Overall, the results of this study indicated that the auditory script training intervention package was an effective intervention for increasing bids for joint attention for children with ASD. Although the intervention was successful, the researchers did note some limitations. One primary limitation was related to the variability in bids for joint attention. Specifically, Gomes et al. (2020) noted that although researchers included multiple exemplars of scripts, participants did not vary comments after scripts were

removed.

The results of these studies indicate that both textual and auditory script training and fading procedures are an effective strategy for increasing bids for joint attention for children with ASD. However, in all three studies, scripts were tied to direct training procedures (e.g., graduated guidance, physical prompting, and vocal prompting to emit the scripted statement) and visual and/or auditory stimuli in the environment. Thus, it is unclear whether the scripted words are actually necessary across either format. Additionally, Pollard et al. (2012) noted that because they did not specifically measure variability of responding, their measurement system did not provide sufficient information regarding the extent to which participant responses were rote and repetitive. Gomes et al. (2020) noted that although they trained multiple exemplars of the scripts, participants did not necessarily vary comments after the scripts were removed. Therefore, more sensitive measurement systems that capture frequency, variability, and content of contextually appropriate language may be warranted.

Social Initiations and Responses

Researchers have also used script training and fading interventions to increase social initiations and responses for children with ASD. For example, Wichnick et al. (2010a) evaluated the effects of an auditory script fading intervention on participants' initiations to peers during play. The researchers measured scripted initiations and unscripted initiations. It is important to note that if a participant emitted a scripted initiation during script fading, this counted as an unscripted initiation. Researchers also

specifically measured novel initiations, which they defined as any initiation that had not been previously used by a participant at any point in the study. Sessions were conducted during a leisure activity time where students in the class followed activity schedules and shared toys. During all sessions, participants were provided with ten bags. Each bag had two toys. Researchers taught the participants to open the bag, remove the toys, and give one of the toys to a peer.

In the baseline condition, scripts were not provided, but instructors provided reinforcement for initiations to peers using the participants' individualized token system. During teaching, voice recording devices with recorded scripts were placed in 7 out of the 10 bags. Researchers used manual guidance to teach participants to remove the auditory recording device and press the button to play the script. After the seven initiations were emitted across three sessions, researchers faded the scripts from end to beginning with the final fading step being removal of the recording device. Researchers used the three remaining toy bags without scripts as generalization probes. Procedures for generalization probes were the same as the baseline condition.

Participants engaged in very few initiations during the baseline condition. After the introduction of the script training and fading intervention, initiations increased for all participants. Further, participants engaged in many novel utterances following script training and fading. Although initiations did not increase initially with the generalization toys, they did increase over time. After script training, participants also engaged in an increasing number of novel unscripted initiations. This study extended research on using script training and fading to promote social initiations for children with ASD.

In an extension of Wichnick et al. (2010a), Wichnick et al. (2010b) implemented an auditory script training and fading intervention to improve responses to peer initiations for three children with ASD. In this study, researchers measured scripted and unscripted responses to initiations. When script fading began, responses were scored as unscripted even if a participant used a previously trained scripted phase. Researchers also measured cumulative number of novel responses, defined as a response the participant had not previously engaged in at any point in the study. Sessions were conducted during table-top activities and participants were provided with bags of toys to share with peers. Wichnick et al. (2010b) used a multiple baseline across participants design to evaluate the effects of the script fading intervention.

In the baseline condition, scripts were not provided with any of the toys and responses to peer initiations were reinforced according to the participants' classroom motivational systems. During script training, researchers added auditory scripts to the participants' bags of toys and used manual prompting to prompt the participants to push the button on the script. After participants emitted eight or more responses across two sessions, script fading began. Researchers faded the scripts back to front and then systematically faded the scripts from the toy bags by removing scripts from some of the toy bags and increasing the number of bags without scripts.

In the baseline condition, participants engaged in little to no responses to peer initiations. After the introduction of script training and fading intervention, responses to initiations increased for all participants. Further, all participants engaged in an increasing cumulative number of novel responses after the introduction of the script training

intervention. Thus, researchers further demonstrated the efficacy of using script training to improve social communication for children with ASD.

In an extension of previous script training studies, Wichnick-Gillis et al. (2016) evaluated the effects of using a script training and fading intervention to teach children with ASD to interact with peers about stimuli in the natural environment. Researchers included three participants with ASD who attended an intervention program for children with ASD. Wichnick-Gillis et al. measured scripted and unscripted interactions. It is important to note that once participants began script fading, the researchers counted all interactions as unscripted. In this study, the researchers evaluated the effects of the intervention using a multiple baseline across participants design.

During all sessions, the participants completed activity schedules that included play and academic activities and received reinforcement according to their individualized motivational systems for engaging in peer interactions. In the baseline condition, the researchers did no superimpose scripts on any of the stimuli. During teaching, researchers superimposed scripts on five stimuli and used manual guidance to teach participants to use the scripts. If the participant did not emit the script, researchers prompted them to touch the script again and if the participant did not emit the script at that point, researchers provided a vocal prompt. After participants emitted all five scripts independently, they began script fading. Scripts were faded back to front with the final fading step being that all scripts were removed. Throughout the study, researchers also assessed generalization of two stimuli that scripts had never been associated with.

In the baseline condition, participants engaged in few interactions with peers.

After the researchers introduced the script training and fading intervention, interactions increased across all participants. Further when scripts were faded, participants began to engage in interactions in the presence of the generalization stimuli. Researchers were also able to fade the scripts to the point that natural stimuli in the environment were controlling responding. Thus, the results of this support findings from previous studies that suggest script training and fading interventions can be an effective strategy for promoting social interactions with peers for children with ASD.

In addition to using script fading interventions to promote social communication in peer play contexts, researchers have evaluated the utility of script training and fading in community and home settings. For example, Brown et al. (2008) evaluated the effects of a textual script fading intervention on social interactions for children with ASD in a mock store and community store context. In this study, researchers measured scripted, unscripted, and generalization interactions. The researchers evaluated the effects of the intervention using a multiple baseline across settings design with baseline (response-contingent modeling) and script fading conditions. Researchers also conducted community pre- and post-tests to determine the extent to which participants engaged in interactions after the script fading intervention.

Prior to the study, Brown et al. (2008) conducted stimulus and reading pre-teaching sessions to ensure participants could identify the stimuli and read the scripts included in the study. In the response-contingent modeling (baseline) condition, a conversation partner responded to initiations from participants by modeling appropriate conversational statements. During script fading, researchers attached printed scripts to

each stimulus. In the beginning of script fading, if a participant did not engage in an interaction for 30 s, the researcher physical prompted the participant to point to a script. After 10 interactions without any prompts, the researchers did not provide any additional prompts. Scripts were faded in a series of steps. The first steps included fading the words from the scripts from back to front. In order to facilitate transfer of stimulus control to objects in the natural environment, researchers gradually removed the scripts from a proportion of the teaching items in additional steps.

In the response-contingent modeling condition, participants engaged in little to no interactions. During the script fading condition, all participants' unscripted interactions systematically increased across all three store settings. Further, participants engaged in more interactions with the generalization stimuli during the script fading condition. During the community store pre-test, none of the participants engaged in any interactions. After script fading, all participants engaged in more interactions with the conversation partner as compared to the pre-intervention test.

Overall, the results of this study indicate that script fading is an effective intervention strategy for increasing interactions for children with ASD in community settings such as stores. Researchers were also able to fade the scripts so that naturally occurring stimuli in the environment were controlling participant responding. However, although this was a successful intervention, it is important to note that the researchers counted previously trained scripted statements as unscripted once scripts were faded. Thus, it is difficult to ascertain the quality and novelty of language used by participants in this study.

Wichnick-Gillis et al. (2019) further evaluated the extent to which script training and fading interventions could generalize to other relevant environments. Specifically, the researchers evaluated the effects of using a script fading package to increase unscripted initiations for three children with ASD in a school setting and then measured generalization to the home setting in the presence of typically developing siblings. Wichnick-Gillis et al. measured scripted and unscripted initiations and evaluated the effects of the intervention using a multiple baseline across activities design.

In the baseline condition, researchers did not superimpose scripts on any of the stimuli. However, the did provide reinforcement for engaging in initiations. During script training, researchers superimposed textual scripts on stimuli related to the relevant activity. Wichnick-Gillis et al. (2019) used manual guidance to teach participants to point to and read the scripts. When participants emitted at least four out of five scripts independently for one session, they began script fading. Scripts were faded back to front by removing one word at a time until the words were all removed. Researchers also conducted at least three generalization probes per condition in the home setting with the participants' typically developing siblings acting as the communication partner.

In the baseline condition, all participants engaged in few unscripted initiations. After researchers introduced the script training and fading intervention, unscripted initiations increased for all participants. Further, all participants engaged in increased initiations during the generalization sessions conducted in the home setting. Overall, the results of this study support script training and fading as a useful intervention for increasing social initiations across both school and home settings.

The studies described above provide support for the use of script training and fading to facilitate social initiations and responses for children with ASD and other related disabilities. Although the interventions were effective, researchers in all but one of the studies described above, researcher counted an initiation/response as unscripted once script fading began even if participants emitted a previously trained scripted phrase. Thus, it is difficult to ascertain the extent to which participants engaged in repetitive responding during each condition. Further, in all studies, the scripted phrases were tied to graduated guidance training procedures and additional stimuli in the environment.

Manding for Information

Several researchers have investigated the effects of script training and fading procedures on manding for children with ASD. For example, Howlett et al. (2011) contrived establishing operations (EOs) and implemented a script training and fading procedure to train one child with a severe expressive language delay and one child with ASD and an expressive language delay to engage in manding for missing items. The researchers utilized a multiple probe across participants design with embedded reversal components that included baseline, script training, generalization, and maintenance conditions.

During baseline, the researchers placed five pictures of toys on a choice board. Each session included five abolishing operation (AO) trials and five EO trials. At the beginning of each trial, the participant selected a picture from the choice board and went to a toy shelf to get the toy. During AO trials, the toy was present, thus eliminating the

need for participants to mand for a missing item. During EO trials, the toy was missing. In the baseline condition, researchers did not prompt the participant to mand for the missing toy. During the script training condition, the researchers played an auditory script to prompt the participant to say "Where's _____?." After emitting the mand, the researcher told the participant the location of the toy. The auditory scripts were faded after participants engaged in the mand for the missing toy during all EO trials across two sessions. Script fading included the following steps: Full script ("Where's _____?"), partial script ("Where's"), and no script. If a participant engaged in an error (e.g., manding for the item's location when the item was present), the researcher returned the toy, presented a distractor task, and prompted the child to the choice board to begin the trial again. After three trials of this error correction procedure, the researcher modeled closed lips. This model prompt was only necessary for one participant. Throughout the study, researchers conducted generalization probes with novel teachers and toys throughout the school day. Procedures for generalization probes were the same as the baseline condition. Follow-up sessions were conducted 3-4 weeks after the script fading intervention condition. In addition to experimental conditions, Howlett et al. (2011) evaluated social validity by asking special education teachers and speech pathologists to rate the likelihood that they would use the script fading intervention.

In the baseline condition, neither of the participants engaged in manding for the missing item during the EO trials. After teaching, both participants used the scripted phrase, "Where's ____" to mand for the missing item. One participant (Billy) learned to discriminate between the EO and AO trials, but the researchers had to conduct script

fading. The other participant (Nick) needed an additional model prompt of closed lips to prevent manding during AO trials. However, because Nick emitted the mand without the auditory script during the full script trials, researchers did not conduct script fading with him. Overall, results indicated that script training and fading was an effective intervention for teaching participants to mand for the location of missing toy items. However, the researchers noted that this study only included two participants, and both participants required slightly different procedural modifications to engage in discriminated manding across EO and AO trials.

Varied Manding

Varied manding represents another area where researchers have implemented script training and fading procedures to promote response variability. For example, Betz et al. (2011) investigated the effects of script training and extinction, both isolated and together, on varied mand frames emitted by three preschool children with ASD during snack time. The researchers conducted baseline, extinction, script training, maintenance, generalization, and follow-up conditions. Throughout the study, the researchers measured the number of different mand frames. In order to be scored as a different mand frame, the authors stipulated that the frame had to differ by more than the researcher's name, edible item, different word order, or adding the word "please" at the end of the request.

During the baseline condition, Betz et al. (2011) reinforced all complete mand frames (e.g., "I would like ____."). Following baseline, the researchers implement an extinction condition where the first response of each mand frame was reinforced, but

additional responses of the same frame were not reinforced. Next, the researchers conducted script training using auditory scripts with colored buttons. During script training, participants were taught to use three mand frames in a serial fashion. That is, participants acquired one mand frame at a time before beginning training for the next mand frame. During script training, the auditory script button was placed in front of the participant. If the participant did not use the script, the researcher manually guided the participant to touch the button on the script. After participants learned to follow the targeted script, researchers conducted script fading by fading one word at a time from the scripts from back to front, and then fading to the colored button on the script. Following each phase of script training, Betz et al. conducted a maintenance phase to determine if participants would use the mand frame without the auditory script and an extinction phase to determine if participants would vary mands when initial mands were no longer reinforced. After completing the study procedures, participants were exposed a generalization and follow-up probes during a natural environment snack time 1-2 weeks later.

Although the study procedures were effective for two participants, one participant (Drew) did not show socially significant increases in mand variability after participating in the script training conditions. Therefore, researchers implemented an alternative intervention for Drew wherein all three auditory scripts were present during every session and researchers semi-randomly prompted the scripts. Scripts were faded backwards, but researchers removed more than one word at a time. Specifically, after Drew mastered the first script, the researchers faded the scripts back to the first word and then to three

colored stickers that were arranged on the placemat.

Results of this study demonstrated that during baseline, all participants engaged in low levels of mand frames (zero or one mand frame per session). Notably, participants still engaged in low levels of novel mand frames during the first extinction condition, indicating that extinction alone in the absence of other teaching procedures may not produce response variability. After implementing the three script training conditions, two participants (Jill and Travis) emitted more novel mand frames during the final extinction condition as compared to the earlier extinction conditions. However, Drew did not emit more mand frames until he entered the alternative intervention condition. During the alternative intervention condition, Drew did engage in a higher number of novel mand frames. In the generalization and follow-up condition, novel mand frames maintained at treatment levels for Jill and Travis, while Drew engaged in only the three mand framed trained with the scripts during this condition.

Overall, Betz et al. (2011) demonstrated that both training procedures to establish different mand frames and a contingency that requires participants to engage in varied responding (e.g., extinction for engaging in repeated mands) may be necessary to promote varied manding. For one participant (Drew), researchers did not see varied manding until they implemented an alternative intervention condition to visually prompt multiple mands simultaneously. Further, when Betz et al. were unable to completely fade the scripts for Drew and he required a visual cue (e.g., colored dots on his placemat) to maintain responding. However, script training and fading procedures provided a targeted training strategy for increasing the mand repertoires of the participants in the study.

In an extension of Betz et al. (2011), Sellers et al. (2016) investigated the effects of a simultaneous script training intervention using textual scripts on mand variability for six preschool children with ASD. All procedures were implemented during a simulated preschool snack time and researchers measured number of different mand frames using the same definition as Betz et al. The researchers conducted script pre-training, baseline, extinction, simultaneous script training, FR1, and generalization probe conditions and evaluated the effects of the intervention within a multiple baseline across participants design with embedded reversal components.

Prior to beginning baseline, Sellers et al. (2016) conducted a pretraining condition where the researchers probed words included in the scripts and trained any words participants did not know. During the baseline condition, Sellers et al. reinforced all complete mand frames with access to the requested edible item. Following baseline, the researchers conducted an extinction condition, wherein only the first occurrence of a mand frame was reinforced, with three out of six participants. Next, the researchers conducted simultaneous script training. During script training, participants were exposed to all of the scripts within the session and scripts were presented sequentially (presented one at a time in a random order) for three participants and concurrently (presented all at once and participants were prompted to use the scripts in a random order) for three participants. During the script training condition, the researcher allowed 5 s for the participant to emit a response. If the participant did not emit a response during that time, the researcher prompted the participant to touch the first word on the script. If the participant still did not emit a response, the researcher prompted the participant to touch

the script and provided a vocal model of the scripted mand frame. Once participants followed all scripts with 100% accuracy for one session, the researchers faded the scripts from end to beginning in either two steps or four steps. For the two-step script fading procedure, researchers faded the script to the first two words and then to the first word. For subsequent returns to the script-training phases for two participants (Nico and Bart), researchers began the fading process by including the first word on the scripts and faded to the first letter of the first word. For the four-step fading procedure, words were faded one at a time and replaced with "____" until the final step, where all script materials were completely removed.

For all six participants, Sellers et al. (2016) conducted an FR1 condition with the same procedures as baseline following script training to evaluate the effects of the script training intervention on varied manding. For one participant (Michelle), faded script materials (the first word of each script) were available during FR1 sessions. For the remaining participants, no script materials were present during the FR1 condition. For three out of the six participants, Sellers et al. implemented additional script training followed by an extinction condition, where only the first mand frame was reinforced.

Results of this study demonstrated that for three out of six participants, post-script training FR1 conditions resulted in mand variability as compared to baseline. However, the variability was minimal and for one participant, variable manding was temporary. For the remaining three out of six participants, post-script training FR1 conditions did not result in mand variability as compared to baseline. However, additional script training followed by extinction did result in variability for two participants. For one participant,

although the script training followed by extinction produced mand variability initially, responding eventually returned to baseline levels.

The results of Sellers et al. (2016) indicate that simultaneous script training procedures alone may result in more variable language for some individuals with ASD. Other individuals may need extinction following script training in order to engage in more varied manding. The researchers noted the importance of considering ways to make mand variability more durable such as selecting some trained mands to put on extinction in subsequent conditions (e.g., Peters & Thompson, 2015) or using multiple schedules to signal changes in reinforcement (e.g., Brodhead et al., 2016).

In addition to extinction, researchers have also investigated the effects of combining other strategies to promote variability such as lag schedules (e.g., Brodhead et al., 2016; Lee & Sturmey, 2014) and discrimination training (e.g., Brodhead et al., 2016) with script training procedures. In another investigation of using script training procedures to promote mand variability for children with ASD, Brodhead et al. extended the current literature by establishing discriminative control of mand variability and evaluated the efficacy of using a lag schedule to increase variability. Three preschool students who attended a university-based preschool for children with ASD participated in the study. Sessions were conducted during a simulated snack time and researchers measured the number of different mand frames and the total number of mand frames emitted by participants.

Brodhead et al. (2016) evaluated the efficacy of the intervention using a nonconcurrent multiple baselines across participants design with embedded multielement

components. The researchers included several conditions that were tied to colored placemats to signal to participants the relevant condition (e.g., baseline, repeat, or vary). Specifically, Brodhead et al. included script pretraining, baseline (white placemat), baseline generalization probe (typical placemat), baseline vary probe (green placemat), baseline no-vary probe (red placemat), baseline extinction of repetition (white placemat), script training varies (green placemat), script training no-vary sessions (red placemat), no script, placemat only, and generalization and maintenance conditions.

In the baseline, baseline generalization, baseline vary, and baseline no-vary conditions, all mands were reinforced. During the baseline extinction condition, the researchers provided reinforcement for a specific mand frame the first time the participant emitted that response. All subsequent repetitions of that specific mand frame were placed on extinction. In the script training phase, researchers randomly alternated between vary and no-vary sessions to establish discriminative control of responding. During vary sessions, a green placemat with four or five scripts on it was placed in from of the participants. Responses were reinforced if they met Lag 2 schedule requirements with two participants and Lag 3 schedule requirements with the third participant. If the participant did not meet the lag schedule requirements or engage in a response for 15 s, the researchers implemented an error correction procedure. The first step of the error correction procedure included a physical prompt to touch the script. If the participant did not respond for 5 s, the researcher provided a physical prompt and a vocal model. When participants engaged in 80% independent mand frames across two consecutive sessions, the scripts were faded. During no-vary sessions, a red placemat with the same scripts

from the vary sessions was placed in front of the participants. In the no-vary condition, researchers only reinforced the use of the mand frame "I want ____." After conducting script training vary and no-vary sessions, researchers implemented no script and placemat only conditions. During the no scripts condition, all scripts were removed from the placemats. The error correction procedure was also removed, and participant responses were reinforced according to the lag schedule requirements (vary sessions) or repetition contingency (no-vary sessions). During the placemat only condition, researchers rotated between the vary and no-vary placemats, but removed the scripts and contingencies associated with the colored placemats. Finally, researchers conducted generalization and maintenance conditions. Generalization sessions and a 2-week follow-up session were conducted at the preschool snack table. For two participants, all responses were reinforced and for one participant, responses that met the lag schedule requirements and repetition contingency were reinforced.

One participant (Gus) engaged in varied responding in the no-vary condition, so the researchers implemented a contingency exposure procedure. The contingency exposure included physically prompting Gus to engage in three repeated responses prior to providing him with the opportunity to respond independently. Following the contingency exposure sessions, Gus still engaged in varied responding during a no-vary session. Therefore, researchers conducted intensive discrimination training. Intensive discrimination training involved rotating the colored placemats and contingencies continuously and providing physical prompts to engage in responding associated with the different contingencies within sessions instead of across sessions.

In the baseline condition, participants engaged in no varied manding or limited varied manding. After exposure to script training, Kent and Zach engaged in varied manding in the vary sessions and repeated manding in the no-vary sessions. Gus initially engaged in varied manding in both the vary sessions and the no-vary sessions. However, following the contingency exposure and intensive discrimination training, Gus engaged in discriminated responding between the vary and no-vary sessions. Kent and Zach also engaged in varied manding in the vary sessions and repeated manding in the no-vary sessions in the no script and placemat only conditions. Gus engaged in discriminated responding in the no scripts condition, but he did not engage in discriminated responding in the placemats only condition. All participants' manding followed the expected pattern of responding from treatment during generalization and follow-up sessions.

Overall, the results of this study support the efficacy of using a script training and fading intervention to promote varied manding in children with ASD. Researchers in this study also implemented lag schedules and colored stimuli to establish discriminated manding across vary (green placemat and lag schedule) and no-vary (red placemat and repetition contingency) conditions. Participants continued to engage in discriminated responding when the scripts and script training error correction procedures were fully removed. Two out of the three participants also continued to engage in discriminated responding in the presence of the colored placemats, even when the contingencies associated with the stimuli were removed.

Although the script training intervention was effective, the authors noted several limitations. First, the authors noted that the participants demonstrated different patterns of

responding in the no scripts condition. Although all participants engaged in discriminated responding, the data were variable as compared to the previous script training condition. Researchers also noted that the intervention included multiple components. Specifically, prompting, lag schedule requirements, and scripts were all included in the training simultaneously. Further, one participant required two additional intervention components (contingency exposure and intensive discrimination training). Therefore, it is difficult to determine which components were responsible for changes in participant responding.

Results of these studies indicate that script training and fading procedures are an effective strategy for increasing manding for information and varied manding for children with ASD. Similar to the studies reviewed above, researchers trained participants to use the scripts using a combination of prompting procedures including graduated guidance, physical prompting, and vocal prompting procedures. Scripts in these studies were also tied to environmental cues such as the presence or absence of a preferred item (e.g., Howlett et al., 2011) or a salient environment cue to engage in varied language (e.g., Brodhead et al., 2016), making it unclear the extent to which the specific words associated with the scripts are actually a necessary component of the intervention. The body of literature discussed above also provides information about the extent to which researchers have successfully faded scripts. For example, both Betz et al. (2011) and Sellers et al. (2016) were unable to fade scripts completely for at least one participant.

Play-Based Commenting

Previous researchers have also used scripts to increase contextually appropriate

commenting during play for children with ASD. For example, Reagon and Higbee (2009) conducted a study investigating the effects of a caregiver-implemented script training and fading intervention on verbal initiations of three children with ASD in the home setting. The researchers evaluated the effects of the intervention using a multiple baseline across participants design and implemented baseline, pre-teaching, script training, and follow-up conditions. Throughout the study, caregivers conducted a session with each of three toys sets: one target toy set and two generalization toy sets. In the baseline condition, caregivers were instructed to play with their child and respond if their child spoke. The caregivers did not initiate conversations and the scripts were not present during this condition. During the pre-training condition, the caregivers arranged toys not used in other sessions and used manual guidance to train the participants to press the button on the auditory scripts. Following pre-training, Reagon and Higbee conducted script training and fading. In this condition, the caregivers introduced three scripts that went along with the target play set. If the participant did not engage in a response within 15 s, the caregiver would prompt them to press the button to emit the auditory script. After the participant emitted all of the scripts correctly for two consecutive sessions, the researchers implemented schedule fading by omitting the last word of each script. If a participant did not initiate a script during fading, the caregiver reintroduced the previous fading step. Throughout schedule training, the caregivers never introduced scripts with the generalization toy sets. Follow-up sessions were conducted two weeks after script training concluded and followed the same procedures as the baseline condition.

Results of this study indicated that all participants acquired the scripts and

engaged in more unscripted verbalizations with the target toy set during script training as compared to the baseline condition. Participants also engaged in more unscripted verbalizations with the two generalization toy sets as compared to baseline and verbalizations maintained at moderate levels during follow-up.

Overall, the results of this study demonstrated that an auditory script training and fading procedure can produce meaningful changes in play-based commenting for children with ASD. Additionally, the intervention was completely caregiver-implemented, indicating that script training and fading procedures may be a feasible intervention strategy for increasing play-based language in the home setting. However, there are some limitations to these procedures that should be noted. First, although the researchers fully faded the language content of the auditory scripts for all participants, the auditory script buttons were still present during the target toy sessions for 2 out of 3 participants. Therefore, it is possible that the button served as a discriminative stimulus to engage in commenting. Second, the script training and fading intervention was fully implemented by caregivers and caregivers developed all script training and fading materials. However, the researchers did not report the time it took caregivers to develop the training and fading materials, which may be particularly important in applied settings such as home, school, and community settings.

In an extension of Reagon and Higbee (2009), Akers, Higbee, Pollard, et al. (2018) replicated the script training procedures but used siblings as implementers of the intervention. The purpose of this study was to evaluate the effects of a script training and fading intervention on contextually appropriate play commenting for three children with

ASD with an age-appropriate play partner (a typically developing sibling) implementing the intervention. Specifically, the researchers measured the effects of a sibling-implemented script training and fading intervention on contextually appropriate statements.

Researchers employed an adapted alternating treatments design, with one target toy set and two generalization toy set conditions, embedded in a multiple baseline across participants design. Akers, Higbee, Pollard, et al. (2018) included pretraining, baseline, generalization, script fading, and follow-up conditions. Prior to the baseline condition, the researchers conducted a pre-training condition where they used Behavioral Skills Training (BST) to teach the siblings how to implement the script fading intervention. During the baseline condition, siblings began the session by saying, “Let us play.” The siblings responded to all comments, but there were no other programmed consequences for commenting. During the script fading condition, researchers developed three auditory scripts for the target toy and siblings presented one of the three scripts every 30 s as necessary. If the participant did not emit the scripted phrase, the sibling physical prompted them to press the auditory button. If the participant did not respond to this prompt, the sibling provided a verbal prompt of the script. When a participant emitted the scripts with 100% accuracy for two consecutive sessions, the researchers conducted schedule fading by fading the scripts from back to front one word at a time. During the generalization toy set sessions, researchers implemented the same procedures as the baseline condition. Follow-up sessions occurred at 4 weeks for two participants and 11 weeks for one participant and followed the same procedures as the baseline condition.

All participants acquired the scripts and researchers were able to fade scripts completely. Following the introduction of the script training and fading intervention, all participants engaged in a higher number of contextually appropriate comments across the target toy and generalization toy conditions. Participants also maintained responding during the follow-up sessions.

Overall, the results of this study extended the work of Reagon and Higbee (2009) by demonstrating that siblings can serve as natural environment script training implementers to increase contextually appropriate play-based language for children with ASD. Interestingly, the researchers were able to fade all components of the scripts (including the recorder buttons) completely. Although the results of this study indicate the script training intervention was effective at increasing play commenting, the researchers did note some limitations. For example, the researchers did not code for the complexity of contextually appropriate statements or categorize statements as novel or variations of previously trained statements. Second, the researchers trained siblings to comment on their own play behavior and did not control for commenting across baseline and treatment conditions. Therefore, it is not possible to determine if the sibling modeling play-based commenting had any effect on participant behavior.

In another evaluation of the effects of script training procedures on play-based commenting, Groskreutz et al. (2015) evaluated the effects of a novel script-frame intervention on comments during play for three preschool children with ASD in a public-school classroom setting. Because previous researchers had obtained variable results when fading scripts, the authors sought to increase the probability of successful fading by

training participants to use script frames, where the researcher provided part of the statement (e.g., “I’m playing with the _____.”) and participants filled in the frame with relevant information in the environment.

In this study, the researchers implemented a multiple probe across participants design to examine the extent to which the novel script-training intervention increased commenting during play. Researchers measured comments, which they defined as a vocal response that included at least one word, repeated comments, and sound effects. The researchers also measured unique comments, defined as a comment that had not been stated previously in the session. Groskreutz et al. (2015) included pretraining, baseline, script-frame intervention, commenting probes, and script-frame fading conditions. During pretraining, the researchers conducted vocabulary training and script-frame pretraining. During vocabulary pretraining, participants were taught to tact aspects of the toy to ensure they had the language to fill in the script frame. Participants also participated in script-frame pretraining, where the researchers taught three script frames. During the baseline condition, the experimenter began the 5-min session by giving the directions, “Let’s play ___.” The experimenter responded to participant comments. If a participant did not make a comment for 30 s, the experimenter made a comment. During the script-frame intervention, researchers attached five examples of each of the three script frames to 15 aspects of the target toy. If a participant did not make a comment during 30 s, the experimenter prompted the participant to point to a script frame. Sessions ended when the participant engaged in all 15 script frame comments. Researchers conducted the commenting probe sessions by providing the training toy set or a novel toy

set without any scripts. Two out of the three participants did not engage in commenting during commenting probes, so researchers conducted script-frame fading. Script-frame fading began when the participants read 14 out of 15 scripts independently for two consecutive sessions. Scripts were faded from the end to the beginning and fading included five steps for one participant and six steps for another participant.

In the baseline condition, participants engaged in low rates of commenting. Following script-frame training, all participants engaged in higher rates of commenting as compared to baseline. One participant continued to engage in high rates of commenting during commenting probes, even when the scripts were not present. The remaining two participants did not maintain high rates of commenting without the scripts, so they began script fading. Researchers were able to fade the scripts for both participants. Additionally, all participants engaged in commenting with novel toy sets and one participant engaged in commenting during a group activity.

Overall, this study extended script training by using a novel script-frame procedure to evoke play-based commenting for preschool children with ASD. The training procedures (e.g., training the frames with many aspects of the toy) may have facilitated generalization, which also helped facilitate untrained commenting. Although the intervention was effective, the authors noted several limitations. First, because the researchers did not measure baseline commenting with the novel toy sets, it is impossible to know whether or not participants would have engaged in commenting with those toys prior to the intervention. Additionally, because the experimenters did not respond to echoic comments, repeated comments, or sound effects, it is possible that these responses

may have effectively been placed on extinction while other types of comments were reinforced, which may have influenced the results.

The previously described studies effectively used script training and fading procedures to promote contextually appropriate commenting during play. However, there are some limitations related to this body of literature worth noting. First, although the caregivers who participated in Reagon and Higbee (2009) developed the scripting materials and implemented the intervention, the researchers did not provide any information about how long it took caregivers to develop all of the auditory scripting materials for the study. This may be a limitation to traditional textual and auditory script formats because interventionists have to make materials for each script they will train in addition to fading step materials for each step in the fading process.

Similar to other script training and fading studies, researchers were unable to completely fade the scripts for all participants. Specifically, two out of three participants in Reagon and Higbee (2009) needed access to the auditory recorder buttons (although the recorders no longer emitted a scripted phrase) to continue to engage in contextually appropriate language. Because of this consideration related to fading, it may be beneficial to train script frames that could be used across materials. Although Groskreutz et al. (2015) trained participants to engage in contextually appropriate play-based commenting by teaching script frames, the researchers did not measure responding with untrained toy sets in baseline. Therefore, there is a need to provide a stronger experimental demonstration of the extent to which script frames promote responding across toy sets.

Finally, although researchers have demonstrated that script training and fading

interventions can increase the frequency of contextually appropriate comments for children with ASD during play, there is limited information about the content of the language children use. In fact, Akers, Higbee, Pollard, et al. (2018) specifically noted the fact that they did not have further information about the complexity and specific content of the comments as a limitation of their study. Grosrkreutz et al. (2015) measured unique comments, defined as a comment that had not been stated in the given session. However, the researchers did not provide a full analysis of the extent to which comments were completely novel versus comments that were variations of previously trained script frames.

Summary and Rationale for the Current Study

Previous researchers have demonstrated that script training and fading procedures can be used to increase bids for joint attention (e.g., MacDuff et al., 2007), promote social communication (e.g., Brown et al., 2008), improve variability in manding (e.g., Betz et al., 2011; Brodhead et al., 2016; Sellers et al., 2016), and increase contextually appropriate play statements (e.g., Akers, Higbee, Pollard, et al., 2018; Groskreutz et al., 2015; Reagon & Higbee, 2009). However, there are some limitations and considerations related to common script training intervention protocols.

Script training and fading interventions are commonly trained using a combination of physical prompting and vocal modeling procedures in addition to the visual cues of the scripts. Additionally, in many script training studies, scripted statements are tied to visual or auditory stimuli in the environment (e.g., Gomes et al.,

2020), tied to play sets (e.g., Reagon & Higbee, 2009; Akers, Higbee, Pollard, et al., 2018), or trained as script frames (Groskreutz et al., 2015), suggesting that responding is evoked by a combination of stimuli in the environment. Because it is not clear whether the words on the scripts in these interventions are actually necessary, it may be possible to use a more generic picture cue to evoke responding. For example, researchers may be able to use a generic picture of the behavior the script would evoke (e.g., a picture of a child talking) instead of textual or auditory scripts. This approach may have several advantages, particularly in applied settings.

Although researchers have demonstrated positive effects implementing both textual and auditory scripts, there are some limitations to these script formats. First, when using textual and auditory scripts in practical settings, clinicians need to create multiple script sets. In these settings, it may be difficult for interventionists to find the time to create and manage comment-specific textual or auditory scripting materials. Second, as many professionals recommend phonics-based instruction for early readers (Morris, 2015), there may be limitations to training whole-word textual script memorization for children who have not yet learned how to read. Third, auditory scripts include an audible vocal prompt, which may be unnatural and stigmatizing in some play settings. Thus, there is a need to investigate additional script training formats that can be used during play in applied settings.

Beyond practical considerations related to the existing textual and auditory script formats, it may be useful to tie generic visual cues to script frames. The existing body of literature provides evidence that it is possible that researchers will not be able to fade

scripts completely for all participants (e.g., Betz et al., 2011; Reagon & Higbee, 2009). In the event that researchers cannot fade scripts completely for a participant, it may be important to develop a script format that facilitates generalization. Thus, it may be advantageous to tie generic cues to script frames as it may be possible for these frames to evoke responding across different toys and play contexts. Further, if researchers demonstrate that it is possible to tie script frames to generic cues, it may be possible to tie several responses to one cue to promote variability in responding, which may provide an advantage over textual script frames.

In addition to the considerations described above, there may be a need to further analyze the variability and content of language during script training interventions. Although some previous researchers have measured novel comments (e.g., Groskreutz et al., 2015; Wichnick et al., 2010a) and others have measured variability in a manding context (e.g., Betz et al., 2011), it is unclear the extent to which participants are engaging in variable responses within a session, particularly in a play context. The existing literature also includes limited information about the content of scripted statements such as whether statements are completely novel, mixed scripts, or variations of previously trained scripted responses. Thus, it may be beneficial to develop a measurement system that provides a more fine-grained analysis of the variability and content of language evoked by scripts during play.

In response to the above considerations, there is a need to examine the utility of implementing script training procedures tied to generic picture cues to promote contextually appropriate play statements for children with ASD. It may also be important

to provide a more fine-grained analysis of the language participants engage in during sessions.

Purpose and Research Questions

The purpose of this study was to extend the existing literature on script training and fading by investigating the effects of a script training intervention using generic picture cues on contextually appropriate play-based statements for children with ASD. The current study addressed the following research questions.

1. What effect will a script training and fading intervention using script frames and generic picture cues have on the number of contextually appropriate play statements for preschool children with ASD?
2. To what extent will responding generalize to novel play sets?
3. To what extent will preschool children with ASD engage in variable contextually appropriate play statements?
4. To what extent will preschool children with ASD emit exact, adapted, mixed, and novel play statements?

CHAPTER III

METHODS

Participants and Setting

Researchers recruited five preschool-aged children with ASD to participate in this study. We obtained informed consent from all participants' caregivers prior to beginning any study activities. Children were eligible to participate if they (a) could label play materials associated with play sets, (b) could repeat up to four-word sentences when provided with a verbal model, and (c) could tolerate physical prompting. Children were not eligible to participate if they engaged in severe challenging behavior (e.g., physical aggression or self-injurious behavior) in a toy-play context. We gathered this information from case manager reports.

Out of the five participants we recruited, two participants were excluded from the study. One participant was excluded due to engaging in a high number of contextually appropriate play statements during baseline. Another participant displayed persistent challenging behavior during the training portion of the study including indicating vocally that he did not like the physical prompting procedures, engaging in property destruction, and becoming physically aggressive with researchers. Multiple attempts at modifying study procedures (e.g., changing prompting procedures, providing explicit verbal instruction about tasks, adding token reinforcement, etc.) to address these challenging behaviors were unsuccessful in reducing this participant's challenging behavior. So, in order to avoid creating a negative learning history in the play context, we made the

decision to withdraw him from the study.

Thus, three participants completed the study procedures. Stevie was a white, English-speaking female student who was 3 years 8 months at the time of the study. She attended a university-based preschool for children with ASD, where she received one-on-one ABA services for 20 hours per week. Stevie performed in Level 2 of the VB-MAPP, and she demonstrated some skills in Level 3. Stevie could imitate two to five-word sentences and she consistently followed one and two-step instructions from adults. Stevie had also consistently demonstrated that she could label objects, shapes, colors, and numbers in the instructional environment, including labeling novel items and materials. Stevie showed interest in and interacted with toy sets by completing some appropriate play actions and making some one-word comments and sound effects, although she did not typically vocally initiate to involve others in her play.

Rose was a white, English-speaking female student who was 3 years 11 months at the time of the study. She attended a university-based preschool for children with ASD, where she received one-on-one ABA services for 20 hours per week. Rose performed in Level 2 of the VB-MAPP. Rose could imitate two- to four-word sentences and she consistently followed one step instructions from adults. Rose had also consistently demonstrated that she could label objects, shapes, colors, and numbers in the instructional environment, including labeling novel items and materials. Rose showed interest in and interacted with toy sets by completing a few appropriate play actions. However, she rarely emitted any play-based comments and the few she used were typically single-word labels of an aspect of the toy (e.g., “Dog”).

Miles was a white, English-speaking male student who was 4 years 9 months at the time of the study. He attended a university-based preschool for children with ASD, where he received small-group ABA services in a social skills group setting for 12 hours per week. Miles performed in Level 2 of the VB-MAPP, and he demonstrated some skills in Level 3. Miles could imitate two- to five-word sentences and he consistently followed one and two-step instructions from adults. Miles had also consistently demonstrated that he could label objects, shapes, colors, and numbers in the instructional environment, including labeling novel items and materials. Miles showed interest in and interacted with toy sets by completing appropriate play actions and making sound effects. However, he typically interacted with play sets alone and was rigid in the way he wanted to play.

We conducted all research sessions in a 2 m x 3 m research room located at a university-based preschool for children with ASD in the Intermountain West region of the US. The research room was empty except for an empty bookshelf against the wall and the play set and corresponding play materials.

Materials

Researchers included play set materials and generic visual cues in this study. The play sets were different for each participant and were selected based on the results of a preference assessment. Based on selection procedures described below, we included Treehouse, Toy Story Camper, Princess, Dolphin Trainer, and School toy sets in the target toy preference assessment for all participants. We included Frozen, Animal Rescue, Pizza Parlor, Construction, and Barn toy sets in the generalization toy preference

assessment for all participants. Throughout all sessions, participants had access to the play set assigned to that session and two figurines that came with the play set. Although some play sets came with more than two figurines, we only included two figurines for each set in an effort to equate the play sets.

Researchers also developed and included three picture cues. The cues were pictures of a child talking attached to a colored background (see Figure 1). The picture cues were printed and laminated, and we used Velcro to attach the cues to parts of the toy set (see Figure 2). Each picture cue was tied to a specific script frame. The red cue was

Figure 1

Picture Cues

Figure 2

Picture Cues Attached to Toy Set

tied to the script frame, “Look at the ____.” The blue cue was tied to the script frame, “I found the _____..” The yellow cue was tied to the script frame, “I’m playing with the ____.” See Table 1 for a list of toys and picture cue locations for each participant.

Table 1

Toys and Cue Locations

Participant	Toy	Yellow cue locations	Red cue locations	Blue cue locations
Stevie Target	Dolphin	Dolphin/Boy	Fish/Pool	Flag/Slide
	Camper	Buzz/Jessie	Wheel/Door	Cooler/Bed
	School	Teacher/Student	Earth/Bell	Clock/Door
Stevie Gen	Construction	Man/Truck	Elevator/Gate	Slide/Crane
	Animal Rescue	Firefighter/Cat	Bath/Door	Tree/Helicopter
	Barn	Horse/Cow	Chicken/Gate	Door/Slide
Rose Target	Princess	Ariel/Cinderella	Door/Rose	Clock/Slide
	Camper	Buzz/Jessie	Wheel/Door	Cooler/Bed
	Treehouse	Dog/Boy	Swing/Tree	Doghouse/Window
Rose Gen	Construction	Man/Truck	Elevator/Gate	Slide/Crane
	Pizza Parlor	Chef/Motorcycle	Sign/Table	Door/Window
	Frozen	Elsa/Olaf	Snowflake/Door	Slide/Stairs
Miles Target	Camper	Buzz/Jessie	Wheel/Door	Cooler/Bed
	Treehouse	Dog/Boy	Swing/Tree	Doghouse/Window
	School	Teacher/Student	Earth/Bell	Clock/Door
Miles Gen	Construction	Man/Truck	Elevator/Gate	Slide/Crane
	Animal Rescue	Firefighter/Cat	Bath/Door	Tree/Helicopter
	Barn	Horse/Cow	Chicken/Gate	Door/Slide

Dependent Variables

Trained data collectors recorded data on contextually appropriate play statements. We defined contextually appropriate play statements as vocalizations that were a minimum of two words and were related to the play scenario. Statements were not scored if they were (a) not contextually appropriate (e.g., “I’m playing with princess.”

while playing with the farm toy), (b) echoic comments, defined as immediate (within 3 s) repetition of one of the adult play partner's responses, (c) stereotypic phrases (if applicable and individually defined for each participant), (d) less than two words, (e) sound effects (not words), (f) character conversations (defined as the participant holding both figurines and engaging in sound effects or conversation between the pieces), or (g) unintelligible. Researchers scored a new contextually appropriate play statement after 3 s had elapsed from the end of the previous statement.

To gather more information about the topography and quality of language participants engaged in, researchers also categorized contextually appropriate play statements into the following statement types: exact scripted statements, adapted scripted statements, mixed scripted statements, and novel statements. Exact scripted statements were defined as contextually appropriate statements that had exact point-to-point correspondence with the first parts of the script frame ("Look at ___.," "I found ____," "I'm playing ____"). Although participants consistently switched out articles in the frames, we still counted these statements as exact. For example, the statements "Look at the fish" and "Look at fish" were both counted as exact statements. Adapted scripted statements were contextually appropriate statements that differed from scripted statements by more than articles, prepositions, and/or pronouns (e.g., "A bed! I found the bed"). We defined mixed scripted statements as contextually appropriate statements that included components of at least two of the script frames (e.g., "Look – I'm playing with the dolphin"). Novel statements were defined as statements the researchers did not train in any of the script frames. To determine the extent to which participants engaged in

variable language throughout the session, we also measured the number of different contextually appropriate play statements. To be scored as a different play statement, the statement needed to differ from previous statements in the session by more than articles, prepositions, and/or pronouns and by more than just filling in the end of the script frame with a different aspect of the toy.

Researchers also measured the number of attending and attending plus echoic prompts delivered in each session to determine the extent to which participants engaged in contextually appropriate statements without attending plus echoic prompts from the research assistant. Delivery of an attending prompt was defined as the research assistant physically prompting the participant to touch one of the picture cues attached to the toy set. Delivery of an attending plus echoic prompt was defined as a research assistant providing a physical prompt to touch a picture cue and a vocal prompt of a contextually appropriate play statement for the participant to imitate.

Response Measurement

All sessions were filmed, and researchers collected data via recorded video. Researchers transcribed all contextually appropriate play statements that met the definition during the session and measured contextually appropriate statements by counting the number of times a participant engaged in an appropriate play statement. Then, researchers categorized contextually appropriate statements into comment types. We measured the number of different contextually appropriate play statements by counting the number of different statements used in a session. Researchers measured the

number of attending and attending plus echoic prompts delivered by counting the number of times a research assistant provided an attending prompt and the number of times a research assistant provided an attending plus echoic prompt within each session. See Appendix A for data collection sheet.

Interobserver Agreement

The primary researcher trained additional data collectors to transcribe contextually appropriate play statements. A second independent observer collected data on all dependent variables for a minimum of 30% of all sessions for all participants and across all conditions. Researchers calculated interobserver agreement (IOA) for the number of play statements by dividing the total number of agreements by the number of agreements plus disagreements and multiplying by 100. An agreement was defined as both data collectors transcribing the same play statement at the same time. Researchers calculated IOA for categorizing contextually appropriate play statements by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. An agreement was defined as both data collectors assigning the play statement to the same category. We calculated IOA for the number of different contextually appropriate play statements by dividing the number of total agreements by the number of agreements plus disagreements and multiplying by 100. Researchers did not resolve disagreements and we defaulted to the primary data for data analysis. See Table 2 for a summary of IOA scores.

Table 2

Mean IOA and Range Percentages for Participants

Participant	Baseline	Training	No Cue	Follow-Up
		Number of Play Statements		
Stevie	91.7 (66.7-100)	90.8 (83.3-100)	86.1 (83.3-88.9)	94.1
Rose	100	94.1 (80-100)	100	95.5 (90.9-100)
Miles	92 (72.7-100)	88.9 (75-100)	100	88.6 (84.2-92.9)
		Different Play Statements		
Stevie	95.8 (83.3-100)	95.6 (87.5-100)	86.1 (83.3-88.9)	90
Rose	100	96 (75-100)	100	100
Miles	96 (87.5-100)	92.5 (83.3-100)	100	85 (80-90)
		Statement Categories		
Stevie	95.8 (83.3-100)	93.9 (80-100)	86.1 (83.3-88.9)	94.1
Rose	100	92.3 (77.8-100)	93.8 (87.5-100)	100
Miles	92 (72.7-100)	88.2 (75-100)	100	85.9 (78.9-92.9)

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

Treatment Integrity

Independent observers collected data on whether the play partner (researcher) (a) had the appropriate play set and materials present, (b) began the session by providing the instruction, "Let's play _____," (c) responded to participant play statements by providing a contextually appropriate response, and (d) did not ask questions or give directions. Independent observers also collected treatment integrity data on whether the research assistant (a) positioned themselves appropriately behind the participant, (b) provided the appropriate prompts (e.g., physical prompt to prompt the child to attend to the cue and physical prompt plus vocal prompt of the statement), and (c) did not ask questions or give directions. Researchers calculated treatment integrity scores by dividing the number of

correctly implemented components by the total number of components and multiplying by 100. Researchers assessed treatment integrity for a minimum of 30% of all sessions for all participants and across all conditions. See Appendix B for treatment integrity data sheet. See Table 3 for a summary of treatment integrity scores.

Table 3

Mean Treatment Integrity and Range Percentages for Participants

Participant	Baseline	Training	No Cue	Follow-Up
		Play Partner		
Stevie	91.4 (80-100)	98.4 (92-100)	92.3 (84.6-100)	95.2
Rose	100	98.2 (90.9-100)	100	100
Miles	92.4 (83.3-100)	95.2 (90-100)	95 (90-100)	94.8 (94.1-95.5)
		Research Assistant		
Stevie	100	98.4 (87.5-100)	100	100
Rose	100	99.4 (92.3-100)	100	100
Miles	100	98.6 (91.6-100)	100	92.3 (84.6-100)

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

A second independent observer also collected IOA on treatment integrity data for a minimum of 30% of sessions researchers collected treatment integrity data on. Researchers calculated IOA on treatment integrity by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. An agreement was defined as both data collectors scoring the treatment integrity step the same way. See Table 4 for a summary of treatment integrity IOA scores.

Experimental Design

We used a nonconcurrent multiple baseline across participants design with

Table 4

Mean IOA and Range Percentages for Treatment Integrity Data

Participant	Baseline	Training	No Cue	Follow-Up
		Play Partner		
Stevie	92.9 (85.7-100)	98.5 (95.5-100)	100	100
Rose	100	100	100	100
Miles	100	98.7 (96.2-100)	100	100
		Research Assistant		
Stevie	100	97.2 (91.7-100)	100	100
Rose	100	96.8 (91.7-100)	100	100
Miles	100	100	100	90.9

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

embedded reversal components to evaluate the effects of the script training intervention using script frames and generic picture cues on contextually appropriate play statements. The researchers implemented baseline, baseline generalization probe, training, training generalization probe, no-cue, cue reintroduction, and follow-up conditions.

Procedures

Preference Assessment

Researchers conducted two five-item, brief MSWO preference assessments (Carr et al., 2000) to identify target and generalization toy sets for the study. The researchers randomly assigned 10 toys sets into 2 preference assessment groups (target and generalization toy sets). The Treehouse, Toy Story Camper, Princess, Dolphin Trainer, and School toy sets were assigned to the target toy preference assessment for all participants. The Frozen, Animal Rescue, Pizza Parlor, Construction, and Barn toy sets

were assigned to the generalization toy preference assessment for all participants. We selected the second, third, and fourth ranked items from the target and generalization toy preference assessments in an effort to equate preference and subsequently rotated the toys from session to session throughout the study.

General Session Procedures

Prior to each session, researchers set up the toy set and attached the picture cues. Researchers semi-randomly rotated through (we did not allow any toy to be used for two sessions in a row) the training toy sets and assigned the toy set to the session using a web-based random number generator. Each picture cue attached to the toy was tied to a specific script frame. The red cue was tied to the script frame, "Look at the ____." The blue cue was tied to the script frame, "I found the _____." The yellow cue was tied to the script frame, "I'm playing with the ____." We selected these script frames because they were the script frames used in Groskreutz et al. (2015) and in that study, these particular frames were selected based on observations of typically developing 3–5-year-old children. To train the picture cues as a script frame, each picture cue rotated between two locations on the toy set. For example, if the participant was interacting with the treehouse toy, during some sessions, the red cue was attached to the swing (e.g., "Look at the swing"). During other sessions, the red cue was attached to the tree (e.g., "Look at the tree"). Researchers semi-randomly rotated through (we did not allow any cue location more than two times in a row) the cue locations and assigned the cue locations for the session using a web-based random number generator.

We conducted all sessions in a research room and each session was 5 min in

duration. In this study, there were two researchers present in each session, an adult play partner and a research assistant, and each played a different role in the study procedures. The adult play partner provided the instructions to begin the session and responded to participant comments throughout the session. Thus, the role of the adult play partner was to serve as a conversation partner for the participant. The research assistant provided prompting according to the training procedures as needed. During all sessions, the adult play partner sat on the ground with the participant and the toy, and the research assistant sat behind the participant. Play partners and research assistants were Board Certified Behavior Analysts (BCBAs) who worked as case managers at the university-based preschool, and both varied across sessions.

During each session, the play set and corresponding play materials were out and available to the participant. Sessions began when the adult play partner said, "Let's play ____." During all sessions, the adult play partner responded to each of the participant's contextually appropriate play statements within 3 s by providing a contextually appropriate verbal response. For example, if a participant said, "Look at the door," the play partner could respond by saying something like, "I see that door. It has a heart on it." Play partners also responded to contextually appropriate requests for information or help by responding in a way that completed the participant's request. For example, if a participant said, "Will you help me open this door?," the play partner could respond by saying something like, "Sure – that door goes into the treehouse!." Then, the play partner would complete the request to open the door. If a participant asked a question or made a comment about something outside of the research room (e.g., "Did you know my mom is

taking us to see animals today?"), the play partner redirected the participant back to the toy set by saying, "Let's keep playing." Aside from scripting the play partner's response to off-topic questions ("Let's keep playing") and asking the play partner to refrain from asking direct questions or giving directions, we did not script the play partner's responses. Play partners were free to generate their own responses because we wanted the play scenario to be as natural as possible. Researchers conducted up to four sessions a day for each participant with a minimum of 5 min between sessions.

Play Partner and Research Assistant Training

The primary researcher used Behavioral Skills Training (BST; Sarokoff & Sturmey, 2004) to train play partners and research assistants to conduct sessions with fidelity. Specifically, the primary researcher provided a verbal and written description of the procedures, modeled the procedures, and had play partners and research assistants practice the procedures while providing feedback. After completing the BST training, each of the play partners and research assistants conducted a practice session with the primary researcher. The primary researcher asked the play partner to set up and begin the session with the primary researcher acting as a child confederate. Play partners completed the training when they responded to 100% of the statements in the practice session correctly. The primary researcher asked research assistants to participate in a practice session with the primary researcher acting as a child confederate. During the practice session, if a research assistant did not provide prompts correctly, the primary researcher provided feedback and began the practice session again. Research assistants completed training when they provided prompts with 100% accuracy during the practice session.

Baseline

During baseline, the play partner began the session by providing the instructions, "Let's play____." The play partner responded to the participant's contextually appropriate play statements, but the research assistant did not provide any prompting or support. The picture cues were attached to the toy set and available for the participants to use. We advanced participants to the next condition after a minimum of five sessions and when we observed a stable pattern of responding.

Baseline Generalization Probes

The procedures for the baseline generalization probes were the same as the baseline condition, except the participant had access to one of the generalization toy sets and the corresponding figurines. We conducted one probe with each generalization toy set. We advanced participants to the next condition after one probe with each generalization toy.

Training

We trained the participants to use the script frames and generic picture cues using a progressive time delay prompting procedure (Walker, 2008). During training, the research assistant provided physical prompting to touch the picture cue and vocal prompting of scripted statements. In this condition, the research assistant wore a Motivaider set to go off every 30 s and physically prompted the participant's hand to touch one of the generic picture cues in a semirandom order. Specifically, the research assistant did not prompt the participant to touch the same cue two times in a row or

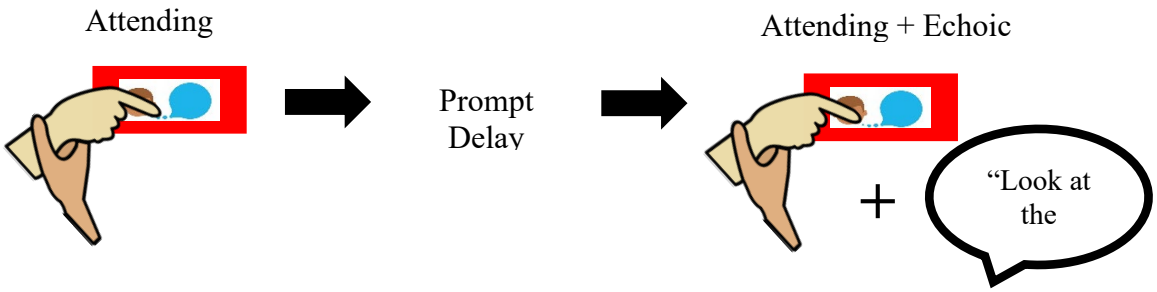
prompt the cues in a predictable order (e.g., red, yellow, blue, red, yellow, blue). If the participant was engaging in a contextually appropriate comment when the Motivaider went off, the research assistant inserted a 5-s delay after they completed the exchange with the play partner before providing the next prompt. The progressive time delay prompting procedure included 0-s, 2-s, 4-s, and 6-s time increments. During the 0-s time delay sessions, the research assistant immediately prompted the participant to touch the picture cue and provided a vocal prompt of a scripted statement for the participant to imitate (attending plus echoic prompt). For each remaining time increment (2-s, 4-s, and 6-s), the research assistant prompted the participant to touch the picture cue (attending prompt) and inserted the time delay before providing the attending plus echoic prompt. If the participant did not engage in a contextually appropriate statement during the designated time delay, the research assistant prompted the participant to touch the picture cue and provided a vocal model of the scripted statement for the participant to imitate. If the participant engaged in a repetitive contextually appropriate statement when the research assistant prompted them to touch a cue (defined as the exact same statement as the previous statement), the research assistant prompted the participant to touch the picture cue and provided a vocal model of a scripted statement for the participant to imitate. See Figure 3 for a visual depiction of the prompting procedures.

We exposed each participant to two sessions at the 0-s time delay increment. For each remaining time delay increments (2-s, 4-s, and 6-s delay), the researchers moved the participant to the next time delay after two consecutive sessions where they received two or fewer attending plus echoic prompts from the research assistant to emit a contextually

appropriate statement. Participants mastered the teaching condition when at the 6-s prompt delay, they received two or fewer attending plus echoic prompts across two consecutive sessions and demonstrated a stable pattern of responding for the number of contextually appropriate play statements.

Figure 3

Prompting Procedures



Training Generalization Probes

Following training, we assessed generalization to three novel toy sets to evaluate the extent to which the generic visual cues evoked contextually appropriate play statements when they were associated with novel play materials. Procedures for generalization sessions were the same as the 6-s time delay procedures from the training condition. We conducted one training generalization probe for each generalization toy set.

No Cue

Researchers conducted the no cue condition with the training toy sets. The procedures were the same as the baseline condition, except the picture cues were not

attached to the toy sets. The researchers moved participants to the next condition after a minimum of five sessions and when participants demonstrated a stable pattern of responding.

Cue Reintroduction

Because all participants engaged in fewer contextually appropriate play statements during the no cue condition as compared to the training condition, we reintroduced the picture cues. Procedures for the cue reintroduction condition were the same as the 6-s time delay procedures from the initial training condition. Participants completed this condition they received two or fewer attending plus echoic prompts across two consecutive sessions and completed a minimum of five sessions where they demonstrated a stable pattern of responding for the number of contextually appropriate play statements.

Follow-Up

After participants completed the training, researchers conducted follow-up probes. The procedures for the follow-up probes were the same as the procedures from the 6-s time delay procedures from the training condition. Researchers conducted one follow-up probe for each training toy and the probes for Rose and Miles were conducted 1- and 2-weeks following the intervention. Due to illness and a family vacation, Stevie missed school for her 1- and 2-week follow-up probes, so we conducted one round of follow-up probes when she returned to school 3-weeks post-intervention.

CHAPTER IV

RESULTS

Number of Contextually Appropriate Play Statements

Figure 4 shows the number of contextually appropriate play statements and the number of statements with attending plus echoic prompts for each of the three participants. The results for Stevie, Rose, and Miles are described below.

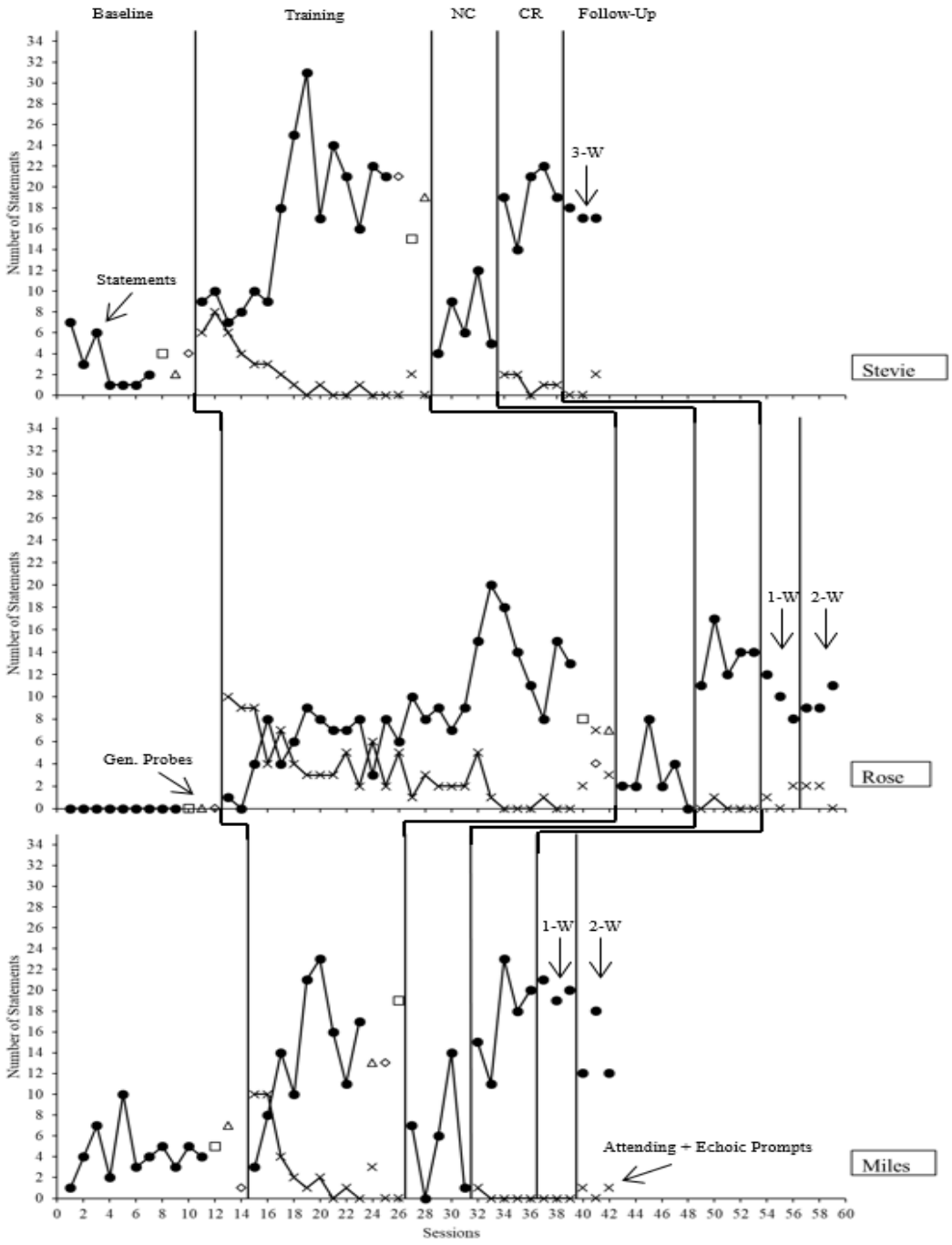
Stevie

Stevie's results for the number of contextually appropriate play statements are depicted in the top panel of Figure 4. In the baseline condition, Stevie engaged in a moderate-low number of contextually appropriate play statements ($M = 3.00$). Although Stevie did engage appropriately with the toys in the baseline condition by completing some play actions and making sound effects, she emitted few contextually appropriate play statements. When researchers conducted the baseline generalization probes, Stevie demonstrated a similar pattern of responding ($M = 3.33$).

When the researchers introduced the generic picture cue intervention, Stevie's appropriate play statements increased and the number of attending plus echoic prompts she required decreased quickly. Overall, Stevie emitted more contextually appropriate play statements during the training condition ($M = 16.53$) as compared to the baseline condition. Stevie mastered the training condition according to the prompting criterion after session 23. However, we observed a decreasing trend in Stevie's data for the number of contextually appropriate play statements after that session; so, she remained in

Figure 4

Number of Contextually Appropriate Play Statements



Note. Number of contextually appropriate play statements for Stevie, Rosa, and Miles across baseline, training, no cue (NC), cue reintroduction (CR), and follow-up conditions. Closed circles represent the number of play statements. Open symbols represent responding with generalization toys. The x's denote the number of attending plus echoic prompts provided in the session.

the training condition at the terminal prompt delay until her data demonstrated a consistent pattern of responding. After Stevie mastered training, the researchers conducted generalization probes with novel toys. During the generalization probes, Stevie engaged in a number of contextually appropriate play statements that was similar to her performance towards the end of the training condition (M = 18.33).

When the researchers removed the picture cues and conducted the no cue condition, Stevie engaged in fewer contextually appropriate play statements than she did in the training condition (M = 7.20). However, Stevie emitted a few more contextually appropriate statements in the no cue condition as compared to the initial baseline condition. Interestingly, researchers observed that all these play statements were novel and without the support of the generic picture cues, Stevie did not emit any of the trained script frames. Following the no cue condition, researchers reintroduced the generic picture cue intervention at the terminal 6-s prompt delay. Stevie's responding immediately returned to levels similar to the initial training condition (M = 19.00). During the 3-week follow-up probes, Stevie maintained responding at the same level as her responding in the training condition (M = 17.33).

Rose

Rose's results for the number of contextually appropriate play statements are depicted in the middle panel of Figure 4. In the baseline condition, Rose did not emit any contextually appropriate play statements. Although Rose did engage in a handful of contextually appropriate play actions in the baseline condition, she did not do so consistently or across all sessions, and she consistently engaged in contextually

inappropriate singing. When researchers conducted generalization probes, Rose did not engage in any contextually appropriate play statements across the three probes.

When the researchers introduced the generic picture cue intervention, the number of contextually appropriate play statements Rose emitted steadily increased and the number of attending plus echoic prompts Rose needed decreased over time. Overall, Rose emitted more contextually appropriate play statements in the training condition (M = 8.74) as compared to the baseline condition. It is important to note that researchers programmed attending prompts for the participant to touch the picture cue every 30 s into each 5-min session. During session 32, Rose began pointing to aspects of the toy that were associated with the generic picture cues and engaging in some vocalizations throughout the session without these attending prompts from the researcher. Thus, she emitted a higher number of contextually appropriate play statements for the majority of the remaining training sessions than she did during the first half of training. Rose mastered the training condition according to the prompting criterion after session 37. However, researchers observed a decreasing trend in Rose's data for the number of contextually appropriate play statements; so, she remained in the training condition at the terminal prompt delay until her data demonstrated a consistent pattern of responding.

After Rose mastered training, the researchers conducted generalization probes with novel toys. Rose did emit some contextually appropriate play statements during the generalization probes (M = 6.33). However, she needed more prompting and emitted fewer play statements as compared to the training condition, particularly during the second generalization probe with the construction toy. Rose struggled to identify some of

the aspects of this particular toy. Specifically, she called the truck associated with the construction toy a firetruck, and although this was likely an age-appropriate error, it did not meet our definition of contextually appropriate, so we corrected her by prompting "truck." Because Rose made this error consistently throughout the session, she needed more attending plus echoic prompts during this generalization probe session as compared to the other two generalization probe sessions.

When the researchers removed the picture cues and conducted the no cue condition, Rose did emit some contextually appropriate play statements throughout the condition (M = 3.00). Interestingly, researchers observed that most of the statements Rose emitted in this condition were previously trained statements. Specifically, Rose would point to the aspect of the toy where there had previously been a cue and emit the statement associated with that cue, even in the absence of the picture cues. Unfortunately, Rose did not maintain this responding consistently or use as many of the trained phrases in the no cue condition as she did in the treatment condition, so the researchers reintroduced the picture cue intervention at the terminal 6-s prompt delay. After reintroducing the training condition, Rose's responding immediately returned to levels similar to the initial training condition (M = 13.60). At 1- and 2-weeks post-intervention, the researchers conducted follow-up probes with Rose. During the 1-week follow-up probes, Rose's responding was slightly lower than her responding in the training condition (M = 10.00). However, Rose did maintain the trained script frames. Her responding was slightly lower because she did not point to and emit contextually appropriate play statements independently as frequently as she did in the previous

training condition. During the 2-week follow-up probes, Rose's responding was similar to her responding during the 1-week probes (*M* = 9.67).

Miles

Miles' results for the number of contextually appropriate play statements are depicted in the bottom panel of Figure 4. In the baseline condition, Miles engaged in a moderate number of contextually appropriate play statements (*M* = 4.36). In the baseline condition, Miles did engage in some contextually appropriate play actions, make some sound effects, and he occasionally made the figurines engage in dialogue (although this language was unintelligible). However, Miles emitted few contextually appropriate play statements. When researchers conducted the baseline generalization probes, Miles demonstrated a similar pattern of responding (*M* = 4.33).

When the researchers introduced the picture cue intervention, Miles' number of contextually appropriate play statements increased, and the number of attending plus echoic prompts he required decreased rapidly. In fact, Miles mastered training after just nine training sessions. Overall, Miles emitted more contextually appropriate play statements in the training condition (*M* = 13.66) as compared to the baseline condition. After Miles mastered training, the researchers conducted generalization probes with novel toys. Overall, Miles engaged in a number of contextually appropriate play statements that was similar to his performance in the training condition (*M* = 15.00).

When the researchers removed the picture cues and conducted the no cue condition, Miles engaged in fewer contextually appropriate play statements than he did in the training condition (*M* = 5.60) and his responding was more variable than the initial

baseline condition. Researchers observed that all of the play statements Miles emitted in the no cue condition were novel and without the support of the generic picture cues, he did not emit any of the trained script frames. Following the no cue condition, researchers reintroduced the generic picture cue intervention at the terminal 6-s prompt delay. Miles' responding immediately returned to levels similar to the initial training condition (M = 17.40). At 1- and 2-weeks post-intervention, the researchers conducted follow-up probes with Miles, and his responding maintained at a similar level as his responding during the previous training condition (M = 17.00).

Number of Different Contextually Appropriate Play Statements

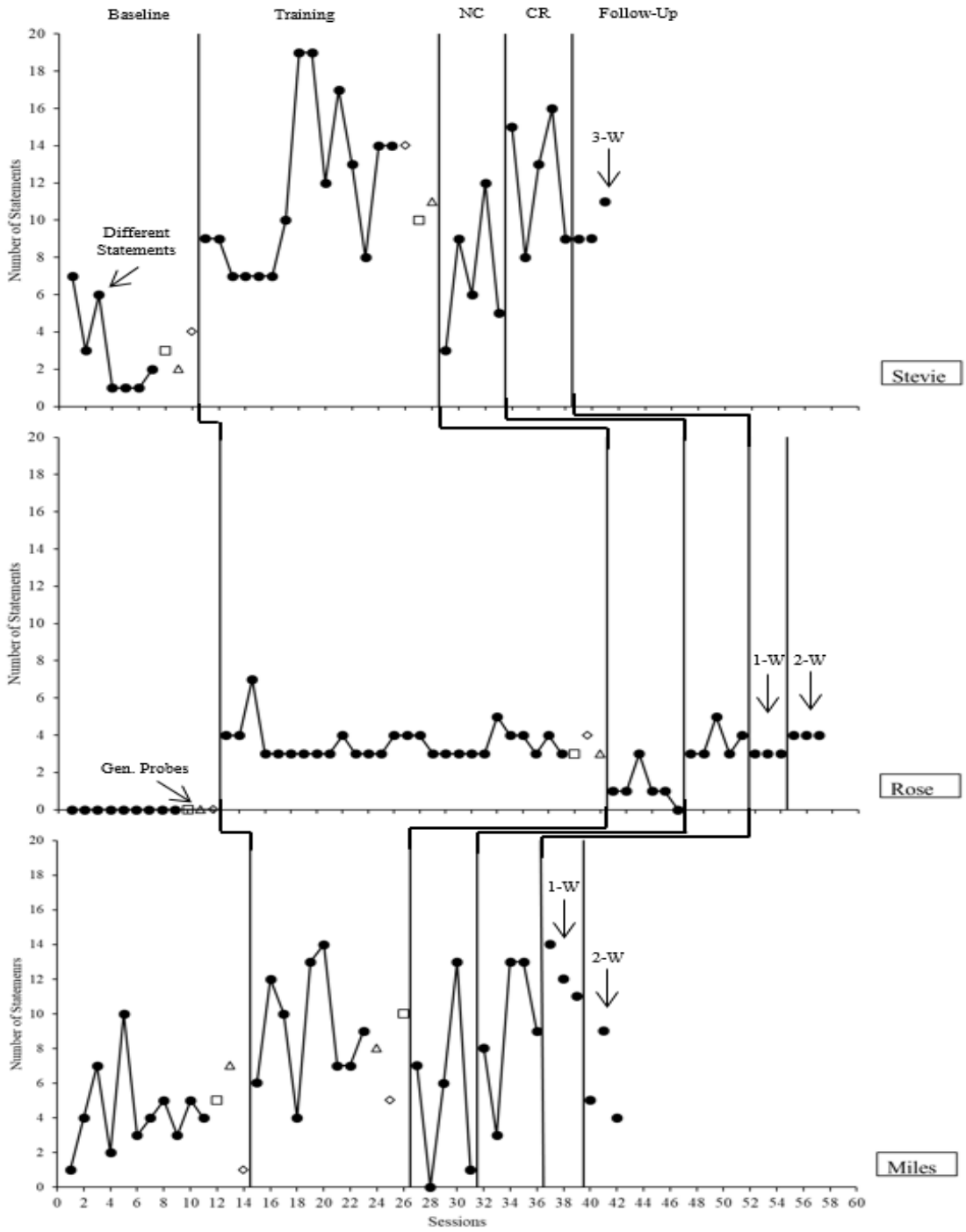
Figure 5 shows the number of different contextually appropriate play statements across three participants. The results for Stevie, Rose, and Miles are described below.

Stevie

Stevie's results for the number of different contextually appropriate play statements are depicted in the top panel of Figure 5. In the baseline condition, Stevie engaged in a moderate-low number of different contextually appropriate play statements (M = 3.00). When researchers conducted the baseline generalization probes, Stevie demonstrated a similar pattern of responding (M = 3.00). During the training condition, Stevie emitted a greater number of different contextually appropriate play statements as compared to the baseline condition (M = 11.47). In addition to using the three trained frames, Stevie consistently emitted novel statements in the training condition and almost all these statements were different from each other.

Figure 5

Number of Different Contextually Appropriate Play Statements



Note. Number of contextually appropriate play statements for Stevie, Rosa, and Miles across baseline, training, no cue (NC), cue reintroduction (CR), and follow-up conditions. Closed circles represent the number of play statements. Open symbols represent responding with generalization toys.

When the researchers removed the picture cues and conducted the no cue condition, Stevie engaged in fewer different contextually appropriate play statements than she did in the training condition (M = 7.00). When the researchers reintroduced the training condition, Stevie's number of different play statements increased back to a similar level as her responding in the initial training condition (M = 12.20). During the 3-week follow-up probes, Stevie's responding maintained at training levels (M = 9.67).

Rose

Rose's results for the number of different contextually appropriate play statements are depicted in the middle panel of Figure 5. Rose did not engage in any contextually appropriate play statements in the baseline condition or when the researchers conducted the baseline generalization probes. During the training condition, Rose emitted more different play statements that she did in the baseline condition (M = 3.56). Although Rose did occasionally emit mixed scripts and novel statements, there were several sessions where she only used the three different frames we trained as part of the intervention. Thus, her data demonstrate a modest increase in the number of different contextually appropriate play statements from baseline to training.

When the researchers removed the picture cues and conducted the no cue condition, Rose engaged in fewer different contextually appropriate play statements than she did in the training condition (M = 1.17). However, researchers observed that Rose emitted at least one of the previously trained frames, even in the absence of the picture cues across most of the sessions in this condition. When the researchers reintroduced the training condition, Rose's number of different play statements increased back to a similar

level as her responding in the initial training condition (*M* = 3.60). During the follow-up probes, Rose emitted three-four different statements, so she engaged in a similar number of different contextually appropriate play statements as she did in the training conditions (*M* = 3.50).

Miles

Miles' results for the number of different contextually appropriate play statements are depicted in the bottom panel of Figure 5. In the baseline condition, Miles engaged in a moderate number of different contextually appropriate play statements (*M* = 4.36). When researchers conducted the baseline generalization probes, Miles demonstrated a similar pattern of responding (*M* = 4.33). Although Miles' data for the number of different play statements show overlap between the baseline and training conditions, on average, he emitted a higher number of different contextually appropriate play statements during the training condition as compared to the baseline condition (*M* = 9.11).

When the researchers removed the picture cues and conducted the no cue condition, Miles engaged in fewer different contextually appropriate play statements than he did in the training condition (*M* = 5.40). When the researchers reintroduced the training condition, Miles number of different play statements increased back to a similar level as his responding in the initial training condition (*M* = 9.20). In addition to using the trained frames, Miles emitted at least some novel statements across all the conditions in the study and almost all these statements were different from each other. This likely explains why there were several sessions that overlapped in the number of different play statements between his baseline and training conditions. During the follow-up probes,

Miles emitted a similar number of different contextually appropriate play statements as he did during the training condition ($M = 9.17$).

Play Statement Categories

Figures 6, 7, and 8 (shown individually after each student) depict the average frequency of play statement types per session across baseline, training, no cue, training, and maintenance conditions for Stevie, Rose, and Miles, respectively.

Stevie

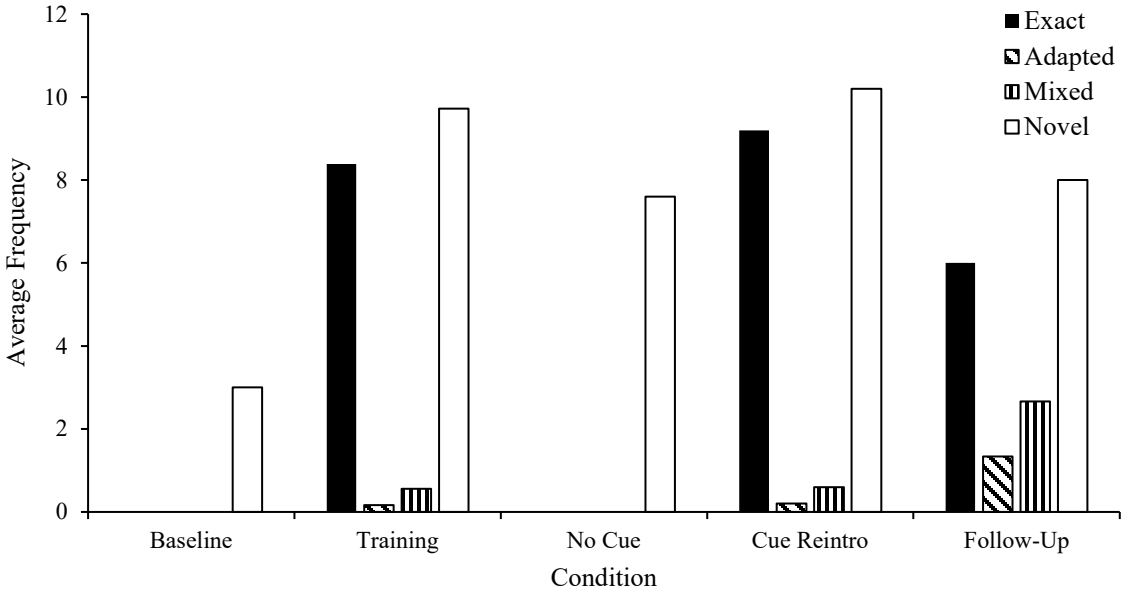
In the baseline condition, Stevie emitted, on average, a low number of novel play statements (see Figure 6). Because we had not introduced the trained statements, all baseline responses were considered novel. During training, Stevie emitted mostly exact and novel statements. Interestingly, she emitted more novel statements on average than exact statements during training. However, Stevie did engage in some mixed and adapted statements as well. In the no cue condition, Stevie's distribution of responding across statement categories was the same as her responding in the baseline condition and she only emitted novel responses. In the return to training condition, Stevie primarily used exact and novel statement types, with a few mixed and adapted statements. During the follow-up condition, Stevie emitted primarily exact and novel statements, but she did engage in more mixed and adapted statements as compared to the training conditions.

Rose

Rose did not emit any contextually appropriate play statements in the initial

Figure 6

Stevie's Average Frequency of Statement Type per Session



baseline condition. During training, Rose emitted mostly exact scripted statements, but she did emit a few mixed and novel statements as well. In the no cue condition, Rose engaged in some previously trained, exact statements and one adapted statement, even in the absence of the picture cues. In the return to training condition, Rose primarily used exact play statements with a few exact, mixed, and novel statements. Finally, the distribution of Rose's responding across statement categories during the follow-up probes was similar to her responding in the training conditions (see Figure 7).

Miles

In the baseline condition, Miles emitted on average a moderate number of novel play statements (see Figure 8). Because we had not introduced the trained statements, all

Figure 7

Rose's Average Frequency of Statement Type per Session

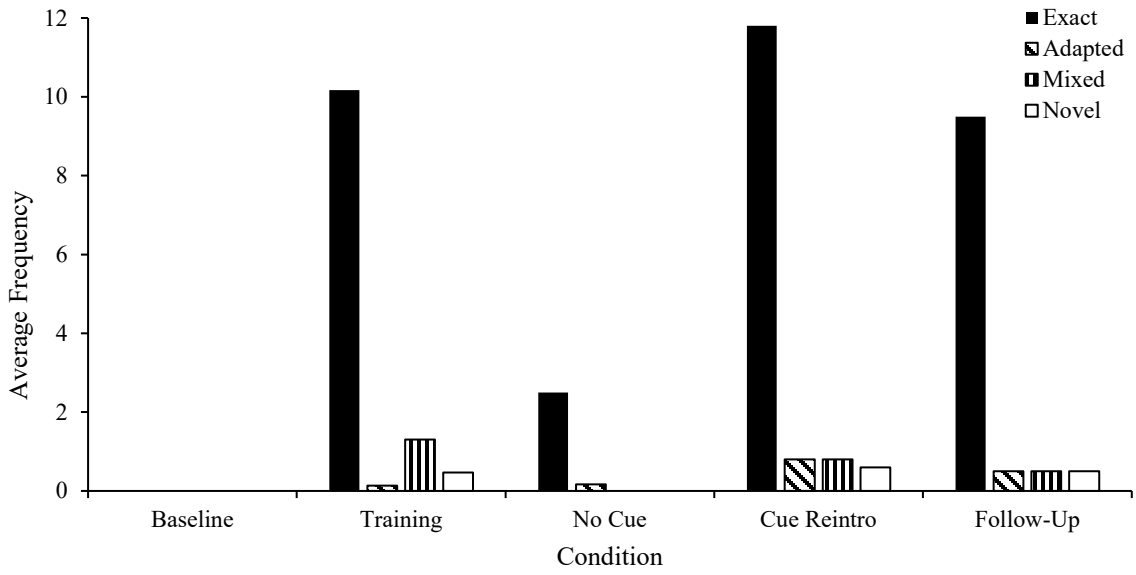
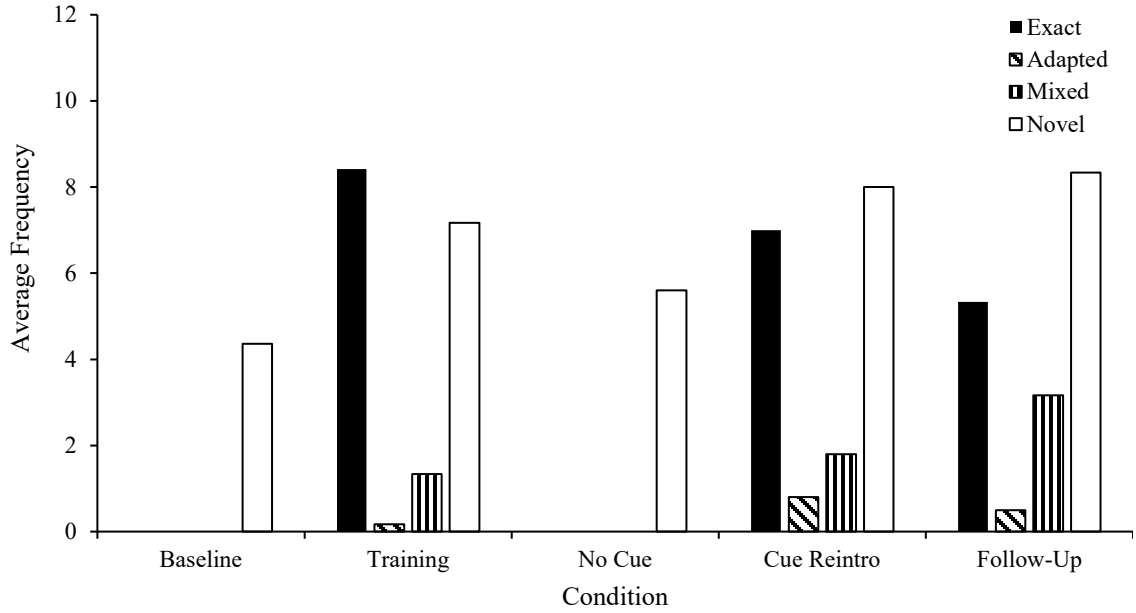


Figure 8

Miles' Average Frequency of Statement Type per Session



responses were considered novel. During training, Miles emitted mostly exact and novel statements. However, Miles did engage in some mixed and adapted statements as well, and he emitted more mixed statements on average than the other two participants. In the no cue condition, Miles' distribution of responding across statement categories was the same as his responding in the baseline condition and he only emitted novel responses. In the return to training condition, Miles primarily used exact and novel statement types. However, he used more mixed and adapted statements than he did in the initial training condition. Finally, the distribution of Miles' responding across statement categories during the follow-up probes was similar to his responding in the cue reintroduction phase.

CHAPTER V

DISCUSSION

In the current investigation, we examined the utility of using generic picture cues tied to script frames to increase contextually appropriate play statements for children with ASD in a preschool setting. Across all participants, we observed increases in the number of contextually appropriate play statements after we implemented the training condition. We observed generalization of responding at training levels to novel toy sets for two participants (Stevie and Miles). Although a third participant (Rose) engaged in fewer contextually appropriate play statements during training generalization probes as compared to her responding in the training condition, she did show considerable improvement from her baseline generalization probes where she did not emit any play statements. When the researchers removed the visual cues during the no cue condition, all participants emitted fewer contextually appropriate play statements as compared to the training condition. However, all participants did engage in a higher number of contextually appropriate play statements during the no cue condition as compared to the initial baseline condition. Finally, when researchers reintroduced the training condition, all participants' responding returned to levels observed in the initial training condition. Although Rose and Miles engaged in a slightly lower number of contextually appropriate statements during the follow-up probes, overall, all three participants maintained responding during the follow-up condition.

The results of this study also indicate that all participants engaged in a greater number of different contextually appropriate play statements during the training

conditions as compared to the baseline and no cue conditions. However, these results were less clear for Miles. Although, on average, he engaged in a higher number of different play statements during the training conditions as compared to the baseline conditions, his data do overlap between these conditions. For all participants, the changes in the number of different statements were likely influenced by the fact that we trained three different script frame exemplars. Further, Stevie and Miles both emitted more novel play statements in the training conditions as compared to the baseline and no cue conditions. Because they consistently used novel statements that differed from each other, the fact that they used more novel statements overall likely contributed to the difference in the number of different play statements they emitted.

The results from our analysis of play statement categories indicated that all participants emitted play statements beyond the exact phrases we trained. Although all three participants engaged in exact scripted responding, Stevie and Miles emitted a near equivalent number of novel statements in the training and cue reintroduction conditions. Further, all participants engaged in at least some adapted and mixed statements, which suggests that the picture cues likely functioned as discriminative stimuli for participants to engage in contextually appropriate play statements generally rather than being exclusively linked to the trained statements.

Script training and fading interventions commonly employ a combination of physical prompting and vocal modeling procedures along with text-based or audio-recorded scripts. In previous script training studies, scripted statements have been tied to visual or auditory stimuli in the environment (e.g., Gomes et al., 2020), tied to play sets

(e.g., Reagon & Higbee, 2009; Akers, Higbee, Pollard, et al., 2018), or trained as script frames (Groskreutz et al., 2015). Further, researchers often program a response from another individual in the environment, such as the contextually appropriate response provided by the adult play partner in the current investigation, into the study procedures. Thus, social script training is a multi-component intervention. In the current investigation, when we used the physical and vocal prompting training procedures used by previous researchers to train participants to use textual (Brodhead et al., 2016) and auditory (Akers, Higbee, Pollard, et al., 2018) scripts, we were able use a generic picture cue to promote responding rather than text-based or audio recorded scripts with point-to-point correspondence with scripted statements. Although we did not conduct a component analysis, the fact that all participants were able to learn the script frames when we tied them to a generic picture cue suggests that the specific words included in textual and auditory scripts may not be a vital component of script training intervention packages. Thus, this study provides initial evidence that researchers can tie script frames to generic picture cues to promote play-based commenting for children with ASD and that the actual visual or auditory stimuli with point-to-point correspondence with the scripted statements may be unnecessary.

In addition to establishing responding with a generic picture cue, this study adds to the existing literature by expanding the measurement procedures from previous studies and providing more detailed information about the types of responses participants engaged in. Although previous researchers have provided information regarding scripted and unscripted responses (e.g., Wichnick et al., 2010a) and the cumulative number of

novel responses participants engaged in (e.g., Wichnick et al., 2010b), it is difficult to ascertain the extent to which participants in previous studies engaged in exact rote repetition of trained scripted statements. A potential criticism of script training interventions is that although researchers may increase the overall number of language responses, participants may only emit a handful of trained responses repeatedly throughout the session. Thus, in the current investigation, we sought to provide more information about the types of comments participants engaged in by categorizing statements into the following statement types: exact, adapted, mixed, and novel.

The results of the statement category analysis indicated that both Stevie and Miles engaged in a higher number of novel responses on average per session in the training conditions as compared to the baseline and no cue conditions. These findings are in line with the results of previous script training studies where researchers have consistently reported that after exposure to the script training intervention, participants commonly engage in more unscripted language (Akers et al., 2016; Wichnick et al., 2010b). Additionally, although the distribution of statement types differed across participants, all three participants engaged in at least some contextually appropriate play statements for each statement category. In fact, both Stevie and Miles emitted a similar number of novel responses on average as they did exact responses. Thus, the results of our analysis suggest that teaching using script training procedures can promote variable communication, which may be particularly important in play contexts.

In addition to the findings described above, the results of this investigation may have several implications for implementing social script training and fading interventions

in practical settings. Many individuals with ASD who could benefit from social script training interventions, such as preschool children who receive early intervention services, are pre-readers or do not have well-developed reading repertoires. Although previous researchers have successfully trained preschool children with ASD to use textual scripts to engage in communication (e.g., Brodhead et al., 2016; Sellers et al., 2016), it is important to consider the potential implications of training whole-word script memorization for children who will eventually participate in phonics-based reading instruction. Although auditory scripts may provide a solution to this potential limitation, they may be stigmatizing and impractical in a play context. In fact, when Pellegrino et al. (2018) piloted the use of auditory scripts embedded in an activity schedule intervention to promote language in a sociodramatic play context, they noted that the auditory scripts interfered with the conversational flow, and they switched to textual scripts for the remainder of the participants. The results of the current investigation support the use of a picture cue to evoke contextually appropriate statements in a play context, which may be a more age-appropriate script format for younger, preschool-aged children.

Throughout this study, we rotated the picture cues across three target training toys, and we also rotated each cue across two different cue locations on each toy in an effort to train the scripts as frames and promote generalization of the generic picture cues across toy sets. Thus, the participants used the same cues across different toy sets and across different aspects/locations of each toy set. Further, we tested generalization of responding to three completely novel toy sets, and two out of three participants (Stevie and Miles) responded at levels similar to their responding in the training condition.

Although Rose's responding during the generalization probes was lower than her responding in the training condition, this was partially an artifact of our measurement procedures because she consistently mislabeled one of the aspects of the construction toy. However, Rose was able to emit the trained frame part of the play statement when they were attached to the novel generalization toys. Thus, researchers used the picture cues across six different toy sets for each participant and ten toy sets total. Having access to a generic picture cue that can be utilized across toys may be beneficial, particularly in practical settings. When interventionists implement comment-specific textual or auditory scripts, it is necessary to create an individual script for each aspect of each toy set, and this may take time that interventionists working in settings with fewer resources may not have. Therefore, generic cues like the cues used in this investigation that can be easily transferred across toys and different aspects of toys may be particularly valuable. Further, previous researchers have reported varying levels of success completely fading scripts for all participants (Akers et al., 2016). Given that previous research indicates it is unlikely that interventionists will be able to completely fade scripts for all individuals who may benefit from script training interventions, it may be beneficial to use a generic visual cue that can be easily transferred across play contexts and materials.

Although the results of this study indicate this intervention was effective for all three participants, there are some limitations to this investigation that should be noted. One limitation of this study is that we did not fade the attending or the attending plus echoic prompts. Given that the primary purpose of this study was to investigate the utility of using a generic picture cue as a script to promote play-based commenting (as opposed

to textual or auditory scripts), fading the prompting completely was beyond the scope of this investigation. Throughout the training condition, the researchers provided an attending prompt by prompting the participant to touch a picture cue every 30 s. Additionally, participants mastered the training condition when they required two or fewer attending plus echoic prompts for two consecutive sessions. Thus, the research assistant provided some amount of prompting and support throughout the training condition. Because we did not fade the prompting, we cannot say whether participants could learn to use this cue completely independently. However, there are a couple of points worth noting related to this limitation.

First, in the current investigation, all three participants consistently responded at a higher level than the prompting we programmed into the intervention, which meant they emitted several play statements independently during each session. Rose's independent responding throughout the study was particularly interesting. Towards the end of the training condition, we observed Rose touching some picture cues independently and emitting the corresponding script frame without receiving an attending prompt from the research assistant. Rose's ability to point to the picture cues and emit the frames independently suggests that it may have been possible to fade the attending prompts. Future researchers should investigate systematic ways to fade prompting so the participant is primarily responding to the picture cue. For example, researchers could use graduated guidance to gradually fade the physical prompt to attend to the cue, or train participants to manage the Motivaider and attend to a different picture cue each time it goes off.

Second, in many previous script training studies, researchers have incorporated support for participants to attend to scripted statements. For example, in some studies, researchers embedded social scripts into activity schedules, which provided a structure to support participants in attending to the scripts as they moved through the schedule (Krantz & McClannahan, 1993). In previous play-based commenting studies, play partners presented auditory scripts by setting an auditory recorder button next to the participant or moving it into the participant's line of vision (Akers, Higbee, Pollard, et al., 2018), which may have functioned as a prompt for the participant to attend to the script. In the current investigation, we programmed attending prompts into the intervention by prompting the participant to touch a cue every 30 s. Future researchers should consider investigating the extent to which these prompts are a necessary component of script training interventions, and if it is possible to fade these supports so the presence of the script itself is sufficient to evoke responding in play situations.

Another limitation related to the prompting in this study is that in some instances, we had to interrupt appropriate play behavior to provide an attending prompt. If the participant was engaging in a contextually appropriate play statement when the research assistant's Motivader went off, we did not interrupt them and we inserted a 5 s delay after the interaction concluded before providing another prompt. However, there were occasions where the participant was engaging in appropriate play actions with an aspect of the toy that did not have a cue attached to it when the researcher had to prompt them to attend to another aspect of the toy. This limitation brings up several interesting questions for future researchers to pursue. Given that this intervention used script frames and

generic picture cues, it may be possible to teach participants to use the cues to comment about play actions they are already engaging in. For example, future researchers may wish to investigate an arrangement where the picture cues are not attached directly to aspects of the toy but are instead placed near the toy. In this arrangement, it may be possible to train participants to touch the cue and fill in the frame with the item they are interacting with. For example, if the participant was engaging in play actions with the dog figurine, the researcher could prompt them to attend to the picture cue near the toy, and they could fill in the frame with that aspect of the toy (e.g., "I'm playing with dog.").

Perhaps one of the more notable limitations of this study is that we did not attempt to fade the picture cues. Although there were no specific words to fade, future researchers may consider investigating strategies to fade the cues, so they are less conspicuous in the play environment. For example, researchers may consider fading the size of the cues or fading the number of cues associated with the toy set. Future researchers may also consider fading the salience of the cue. For example, researchers may fade the colored part of the cue.

There are some additional limitations of this study related to the measurement system we developed. For example, in the current investigation, we did not collect normative data of typically developing children engaging in contextually appropriate play statements under the conditions of the study procedures. Thus, we cannot compare participant responding to the responding of same-age typically developing peers. Future researchers may consider collecting normative data throughout the study procedures to compare contextually appropriate play statements emitted by children with ASD to the

play-based language used by typically developing children. It may also be valuable for future researchers to collect a normative data sample prior to beginning study procedures to set age-appropriate goals and mastery criteria for the training condition.

Finally, engaging in play with a partner is a complex process that requires a child to engage in a variety of behaviors to participate in a meaningful way. The purpose of this study was to increase contextually appropriate play statements, and our measurement system captured and categorized these statements. However, we also observed participants engaging in appropriate play actions, emitting appropriate sound effects, and using appropriate one-word vocalizations (e.g., “Go!”). This study is limited in that we did not capture or measure any of these other appropriate play behaviors and it is likely that these play behaviors are equally important for children with ASD to successfully navigate play situations. Thus, future researchers should consider developing and implementing an expanded measurement system that captures all these play behaviors.

Overall, this study provides initial evidence that it is possible to use generic picture cues to promote play-based commenting for children with ASD and that the actual visual or auditory stimuli with point-to-point correspondence with the scripted statements may be unnecessary. These results are important because generic picture cues may be a more socially appropriate script format for young, preschool-aged children, and these generic cues can be used across a variety of play materials. Given the importance of promoting language during play for young children, this represents a socially significant area of study, and we hope these findings and the discussion of future directions will be useful for interventionists and future researchers.

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APPENDICES

Appendix A

Data Collection Sheet

Contextually Appropriate Play Statements Data Sheet

Participant: _____ Date: _____

Observer: _____ IOA: _____

Session Start Time: _____ Session End Time: _____

Statement	Time	Type				Prompts		
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic
		Exact	Adapted	Mixed	Novel	None	Attend	Attend + Echoic

	Session Totals
Total Statements	
Different Statements	
Exact Statements	
Adapted Statements	
Mixed Statements	
Novel Statements	
No Prompts	
Attending Prompts	
Attending + Echoic Prompts	

Appendix B

Treatment Integrity Data Sheet

Play Partner Treatment Integrity Data Sheet

Data Collector: _____ IOA: _____
Participant: _____ Session #: _____
Play Partner: _____ Researcher: _____

Directions: Mark whether the play partner correctly completed each component.

Integrity Items	Score	Total
Relevant play set and corresponding materials present and set up		1
Picture cue materials set up on the correct parts of the toy		1
Play partner began the session by providing the instructions, "Time to play____."		1

Statement	Time	+/-
		+ -
		+ -
		+ -
		+ -
		+ -
		+ -
		+ -
		+ -
		+ -
		+ -
		+ -
		+ -
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		+ -
		+ -

Play partner responded to play comments that met the definition.		
The play partner did not ask questions or give directions.		1

Treatment Integrity Percentage: (# of Yes/Total) = ___/___ *100 = ____%

Research Assistant Treatment Integrity Data Sheet

Data Collector: _____ IOA: _____
Participant: _____ Session #: _____
Play Partner: _____ Researcher: _____

Directions: Mark whether the research assistant correctly completed each component. Attending prompts should be a physical prompt to touch the cue. Attending plus echoic prompts should be a physical prompt to touch the cue plus a vocal model of the statement.

Integrity Items	Score	Total
Research assistant sat near the participant		1
Research assistant provided the appropriate prompts.		
The research assistant did not ask questions or give directions.		1

Prompt Type		+/-
Attending	Attending + Echoic	+ -
Attending	Attending + Echoic	+ -
Attending	Attending + Echoic	+ -
Attending	Attending + Echoic	+ -
Attending	Attending + Echoic	+ -
Attending	Attending + Echoic	+ -
Attending	Attending + Echoic	+ -
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Attending	Attending + Echoic	+ -
Attending	Attending + Echoic	+ -
Attending	Attending + Echoic	+ -
Attending	Attending + Echoic	+ -

Treatment Integrity Percentage: (# of Yes/Total) = ___/___ *100 = ____%

CURRICULUM VITAE

STEPHANIE L. MATTSON, M.S., BCBA, LBA-UT

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EDUCATION

Utah State University, Logan, UT
Ph.D., Disability Disciplines, expected May 2022
Advisor: Thomas S. Higbee, Ph.D., BCBA-D, LBA-UT
Dissertation: Using generic picture cues to promote verbal initiations during play

Utah State University, Logan, UT
M.S., Special Education, July 2018
Advisor: Sarah E. Pinkelman, Ph.D., BCBA-D, LBA-UT
Thesis: On-task behavior for students in a resource classroom setting: Effects of activity schedules on on-task behavior

Utah State University, Logan, UT
B.S., Special Education: Mild-Moderate and Elementary Education, May 2014
Honors: Magna Cum Laude

CERTIFICATION AND LICENSURE

Board Certified Behavior Analyst, Certification No. 1-18-34247
State of Utah, Licensed Behavior Analyst, Reference No. 11346037-2506
Utah Department of Education Teacher Licensure Level 2/Professional License in K-12 Special Education and Elementary Education (1-8)

CLINICAL EXPERIENCE

2018-present	BCBA Autism Support Services: Education, Research, and Training (ASSERT) Logan, UT
2019-2020	ABA Consultant (Applied Academic and Functional Life Skills Classes) Granite School District Salt Lake City, UT
2019-2020	ABA Consultant (Initial Skills Classes) Nebo School District Salem, UT

2018-2019	PBIS Consultant (Tier 1 and Tier 3 Teams) Edith Bowen Laboratory School Logan, UT
2016-2018	Clinician Utah Behavior Support Clinic Logan, UT
2016-2018	Special Education Teacher (Mild-Moderate) South Cache Middle School Hyrum, UT
2014-2016	Special Education Teacher (Mild-Moderate) Willow Valley Middle School Wellsville, UT
2011-2014	Lead Instructor Autism Support Services: Education, Research, and Training (ASSERT) Logan, UT

PUBLICATIONS

6. Aguilar, J., Peck, S., **Mattson, S. L.**, Reinert, K. S., Higbee, T. S., Lindgren, N. A., & Osos, J. A. (accepted). Caregiver-implemented digital activity schedule with virtual coaching.

5. Smith, S. G., **Mattson, S. L.**, Aguilar, J., Pyle, N., & Higbee, T. S. (accepted). Behavioral skills training with adult interventionists.

4. Becerra, L. A., Higbee, T. S., Galizio, A., **Mattson, S. L.**, Aguilar, J., Hinnenkamp, J, & Reinert, K. S. (in press). An interactive computerized training to teach educators how to respond during an active shooter situation. *Journal of Applied Behavior Analysis.*

3. **Mattson, S. L.**, Higbee, T. S., Aguilar, J., Nichols, B., Campbell, V. E., Nix, L. D., Reinert, K. S., Peck, S., & Lewis, K. (2020). Creating and sharing digital ABA instructional activities: A practical tutorial. *Behavior Analysis in Practice*, *13*(4), 772–798. https://doi-org.dist.lib.usu.edu/10.1007/s40617-020-00440-z

2. Walker, S. G., **Mattson, S. L.**, & Sellers, T. P. (2020). Increasing accuracy of rock-climbing techniques in novice athletes using expert modeling and video feedback. *Journal of Applied Behavior Analysis*, *53*(4), 2260–2270. https://doi-org.dist.lib.usu.edu/10.1002/jaba.694

1. **Mattson, S. L.**, & Pinkelman, S. E. (2020). Improving on-task behavior in middle school students with disabilities using activity schedules. *Behavior Analysis in Practice*, *13*(1), 104–113. https://doi-org.dist.lib.usu.edu/10.1007/s40617-019-00373-2

PUBLICATIONS IN PREPARATION

Mattson, S. L., Higbee, T. S., Nichols, B., Aguilar, J., & Campbell, V. E. (in preparation). Effects of activity schedules on cooperative vocal exchanges during learning centers.

Mattson, S. L., & Joslyn, P. R. (in preparation). Latency measurement in functional analysis and treatment of problem behavior: A concise review.

Griffith, K. R., Page, S. V., Aguilar, J., **Mattson, S. L.**, & Detrich, R. (in preparation). Have the *What Works Clearinghouse* standards for single-case designs influenced behavior analytic research?

Hoffmann, A. N., Lee, J. L., Walker, S. G., **Mattson, S. L.**, & Sellers, T. P. (in preparation). Teaching discriminated use of a tablet device for leisure and educational activities.

RESEARCH IN PROGRESS

Aguilar, J., Nichols, B., **Mattson, S. L.**, Campbell, V. E., & Higbee, T. S. (in progress). A component analysis of interactive computerized training.

Mattson, S. L., Higbee, T. S., Lindgren, N. A., & Osos, J. A. (in progress). Training caregivers to conduct digital instructional activities in the home.

PROFESSIONAL PRESENTATIONS

14. Nichols, B., **Mattson, S. L.**, Aguilar, J., & Higbee, T. S. (2022, March). How to use scripts to facilitate communication in various settings. Workshop given at the Utah Valley University Autism Conference. Orem, UT.

13. Smith, S. G., **Mattson, S. L.**, Aguilar, J., Pyle, N., & Higbee, T. S. (2021, August). Behavioral skills training with adult interventionists. Poster presented at the Annual Utah Association for Behavior Analysis Conference. Virtual.

12. Becerra, L. A., Higbee, T. S., Galizio, A., **Mattson, S. L.**, Aguilar, J., Hinnenkamp, J, & Reinert, K. S. (2021, May). An interactive computerized training to teach educators how to respond during an active shooter situation. In A. M. Campanaro (Chair) *Recent advancements in training procedures to teach safety skills.* Symposium presented at the Annual Association for Behavior Analysis International Convention. Virtual.

11. **Mattson, S. L.**, Higbee, T. S., Nichols, B., Aguilar, J., & Campbell, V. E. (2021, May). Effects of linked activity schedules on contextually appropriate vocalizations during cooperative completion of academic learning centers. In B. Nichols (Chair) *Behavior analytic teaching procedures using visual supports and behavioral skills training.* Symposium presented at the Annual Association for Behavior Analysis International Convention. Virtual.

10. Smith, S. G., **Mattson, S. L.**, Aguilar, J., Pyle, N., & Higbee, T. S. (2021, May). Behavioral skills training with adult interventionists. In B. Nichols (Chair) *Behavior analytic teaching procedures using visual supports and behavioral skills training.* Symposium presented at the Annual Association for Behavior Analysis International Convention. Virtual.

9. Griffith, K. R., **Mattson, S. L.**, Aguilar, J., Page, S. V., & Detrich, R. (2021, May). How the *What Works Clearinghouse* single-case design standards influence dissemination of behavior analytic research. In R. Detrich (Chair) *Have the What Works Clearinghouse standards for single-case designs influenced behavior analytic research?* Symposium presented at the Annual Association for Behavior Analysis International Convention. Virtual.

8. Page, S. V., Aguilar, J., **Mattson, S. L.**, Griffith, K. R., & Detrich, R. (2021, May). Applying the *What Works Clearinghouse* single-case design standards to applied behavior analytic research. In R. Detrich (Chair) *Have the What Works Clearinghouse standards for single-case designs influenced behavior analytic research?* Symposium presented at the Annual Association for Behavior Analysis International Convention. Virtual.

7. Higbee, T. S., **Mattson, S. L.**, & Reinert, K. S. (2021, March). Creating digital activity schedules and digital learning activities to promote independence and skill acquisition in the home and classroom. Invited workshop given at the Utah Valley University Autism Conference. Orem, UT.

6. **Mattson, S. L.** & Pinkelman, S. E. (2019, August). Improving on-task behavior in middle school: Modified activity schedules. Poster presented at the Annual Utah Association for Behavior Analysis Conference. Salt Lake City, UT.

5. **Mattson, S. L.** & Pinkelman, S. E. (2019, May). Improving on-task behavior in middle school: Modified activity schedules. In S. E. Pinkelman (Chair) *Efficient and resource-saving interventions in middle schools: Two empirical examples.* Symposium presented at the Annual Association for Behavior Analysis International Convention. Chicago, IL.

4. **Mattson, S. L.** & Pinkelman, S. E. (2019, February). Effects of activity schedules on on-task behavior of middle school students. In T. S. Higbee (Chair) *Building academic and social skills through recent advances in activity schedules.* Symposium presented at the Annual California Association for Behavior Analysis Conference. Long Beach, CA.

3. Hoffmann, A. N., Lee, J. L., Walker, S. G., **Mattson, S. L.**, & Sellers, T. P. (2018, October). Teaching discriminated use of a tablet device for leisure and educational activities. In S. Bancroft (Chair) *A non-leisurely approach to teaching leisure.* Symposium presented at the 29th annual meeting of the Berkshire Association for Behavior Analysis Therapy. Amherst, MA.

2. Hoffmann, A. N., Sellers, T. P., Lee, J. T., **Mattson, S. L.**, & Walker, S. G. (2018, May). Teaching discriminated use of a tablet device for leisure and educational activities with children with Autism. Poster presented at the Annual Association for Behavior Analysis International Convention. San Diego, CA.

1. Hoffmann, A. N., Brady, A. M., Paskins, R., Lee, J. T., **Mattson, S. L.**, & Sellers, T. P. (2017, August). *Examining high-tech variables to improve client outcomes*. Symposium presented at the Annual Utah Association for Behavior Analysis Conference. Salt Lake City, UT.

OTHER PRESENTATIONS AND TRAININGS

Mattson, S. L., Aguilar, J., & Higbee, T. S. (2019, August). Discrete trial instruction, activity schedules, and naturalistic instruction. Training provided for Nebo School District teachers and paraprofessionals. Salem, UT.

Mattson, S. L., & Aguilar, J. (2019, April). Behavioral interventions for students with Autism. Invited lecture given in undergraduate Interdisciplinary Disability Awareness and Service-Learning course. Utah State University. Logan, UT.

Mattson, S. L., & Reinert, K. S. (2019, February). Understanding behavior: General strategies to promote success. Invited lecture given in graduate Speech and Language Pathology seminar. Utah State University. Logan, UT.

Reinert, K. S., **Mattson, S. L.**, & Higbee, T. S. (2018, July). Autism and Applied Behavior Analysis. Training provided for Weber School District teachers and paraprofessionals. North Ogden, UT.

TRAINING PROJECTS

2021-present **Project:** Utah Paraeducator Behavior Summit
Role: Behavior Group Facilitator
Location: Virtual
Description: The Utah Paraeducator Behavior Summit is an Interagency Outreach Training Initiative (IOTI) project that provides basic behavioral training for paraeducators working in schools across Utah. I facilitate clarification of concepts and problem-solving with training content with paraprofessionals in a small group setting.

2018-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.

INTERNATIONAL TRAINING PROJECTS

2018-2020 **Project:** ASSERT Global Outreach-Brazil
Role: ABA Trainer and Consultant
Location: Autism Support Services: Education, Research, and Training (ASSERT),
Logan, UT
Description: ASSERT Global Outreach-Brazil is a collaborative international project directed by Dr. Thomas S. Higbee to provide training to professionals working with children with disabilities in Brazil. Under the supervision of Dr. Thomas S. Higbee, I have trained professionals from Brazil to implement behavior analytic assessment and instructional techniques.

September 2019 **Project:** ASSERT Global Outreach-Russia
Role: ABA Trainer and Consultant
Location: Nizhny Novgorod, Russia
Description: ASSERT Global Outreach-Russia is a project funded by the Naked Heart Foundation that provides training and assistance to parents of children with disabilities and the professionals that provide services to these families in Russia. Under the supervision of Dr. Thomas S. Higbee, I have provided training and case consultation support to interventionists implementing ABA services in Russia.

GRANTS

2019 **Project:** An evaluation of ICT and tele-health feedback on interventionist implementation of discrete trial instruction in an international setting
Role: Student Investigator
Agency: Society for Advancement of Behavior Analysis
Amount: $1,000, *not funded*

UNIVERSITY TEACHING

Fall 2020 **Course:** SPED 5012: Applied Behavior Analysis I: Principles, Assessment, and Analysis
Type: Blended asynchronous/synchronous distance course
Role: Instructor

Fall 2019 **Course:** SPED 5012: Applied Behavior Analysis I: Principles, Assessment, and Analysis
Type: Blended asynchronous/synchronous distance course
Role: Instructor

Spring 2019 **Course:** SPED 5010: Applied Behavior Analysis I: Principles, Assessment, and Analysis
Type: Mixed format on-campus and synchronous distance course
Role: Teaching Assistant

HONORS AND AWARDS

August, 2019	Poster Competition Winner, Utah Association for Behavior Analysis Conference
May, 2019	Graduate Student Travel Award ($300), Office of Research and Graduate Studies, Utah State University

ORGANIZATIONAL SERVICE

2020-present	Curriculum Development Team, Autism Support Services: Education, Research, and Training (ASSERT)
2018-present	Practicum Supervisor, Autism Support Services: Education, Research, and Training (ASSERT)
2019-2020	Volunteer, Utah Association for Behavior Analysis Conference
2018-2020	Instructor Evaluation Coordinator, Autism Support Services: Education, Research, and Training (ASSERT)
2017-2018	Middle School Math Practicum Cooperating Teacher, South Cache Middle School
2017-2018	Essential Standards Development Team, South Cache Middle School
2016-2018	Student Assistance Team, South Cache Middle School
2014-2016	Student Assistance Team, Willow Valley Middle School

PROFESSIONAL AFFILIATIONS

2018-present	Association for Behavior Analysis International
2017-present	Utah Association for Behavior Analysis