Effect of motivation on teaching conversational skills to children with Autism

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GEETIKA AGARWAL

Dr. Rebecca McCathren and Dr. Craig Frisby, Dissertation Co-Chairs

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The undersigned, appointed by the dean of the Graduate School, have examined the dissertation entitled

EFFECT OF MOTIVATION ON TEACHING CONVERSATIONAL SKILLS TO CHILDREN WITH AUTISM

presented by Geetika Agarwal, a candidate for the degree of doctor of philosophy,

and hereby certify that, in their opinion, it is worthy of acceptance.

Professor Craig Frisby
Professor Rebecca McCathren
Professor Wendy Reinke
Professor Steve Osterlind
Professor Andrew Knoop

Dedication

I dedicate this dissertation to my husband, Ankur Gupta and my parents, Yashodha and Pushpak Agarwal. Ma and Papa, thank you for believing and supporting my dreams. Ankur, your unrelenting love and support kept me going through my graduate studies. I could not have done it without you!!!!

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A successful man is one who can lay a firm foundation with the bricks others have thrown at him – David Brinkley

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Abstract

Deficits in conversational skills of children with ASD are persistent and are particularly evident in settings where there are greater opportunities for social and peer interaction (MacKay, Knott, & Dunlop, 2007). These deficits pose difficulty in these children's learning and developing social relations and interactions with other peers/individuals (Loveland & Landry, 1986).

The present study examined the role of motivation on the acquisition of conversational skills in three children with the diagnosis of autism. All the participants possessed good imitation skills but had difficulties in asking or responding to questions, initiating and maintaining conversation. Intervention used the procedure of scripts and script fading. Scripts were based on the participants' preferred and non-preferred items.

The results of the study indicated that the role of motivation was mixed. For the majority of the hypothesis, the participants did not show an increase in initiation, increase in scripted conversation, faster learning or better generalization in the high motivation conditions when compared to the low motivation conditions. However, motivation did seem to play a role in the unscripted conversation and the participants showed an increase in unscripted conversation in the high motivation conditions when compared to the low motivation conditions.

Chapter 1: Introduction

Context of the Problem

There has been an exponential increase in the prevalence of children diagnosed with Autism Spectrum Disorder (ASD) over the last few decades (Roth & Rezaie, 2011). ASD is a developmental disability that affects one out of every 88 children. Approximately one in 54 males and one in 252 females are diagnosed with ASD (Center for Disease Control and Prevention (CDC), 2012). Characteristics of ASD include atypical development in socialization, communication, and restricted/repetitive pattern of behavior (Diagnostic and Statistical Manual- Fourth Edition Text Revision [DSM-IV TR], 2000). Many children with ASD also have deficits in language development which includes delays in saying single words (Tager-Flusberg & Caronna, 2007), labeling or naming objects in their environment (Baldwin, 1991), comprehending several words and phrases spoken by caregivers, and/or continually developing vocabulary in addition to complex receptive and expressive language (Baldwin, 1991).

While some children may not present delays in language development, their communication and conversational skills are still atypical, and they may exhibit several deficits while engaging in a conversation. Some of these deficits include an inability to initiate and maintain conversation (Capps, Kehres, & Sigman, 1998; Frith, 1989; Manolitsi & Botting, 2011; Paul, 1987; Perlock & Nelson, 2012; Reed, Hyman & Hirst, 2011; Tager-Flusberg, 1989), difficulty maintaining reciprocal conversation by engaging in effective turn taking (Capps, et. al., 1998; Reed, Hyman & Hirst, 2011), asking irrelevant questions during a conversation (Hurtig, et al., 1982), providing inadequate responses when asked or presented with a question as part of a conversational exchange

(Baltaxe & D'Angiola, 1992), and difficulty making judgments about how much or how little information to provide during a conversation (Paul, et al., 2009, Rutter, Mawhood, & Howling, 1992). Children with ASD may also have difficulty using words related to emotions and thoughts (Hobson & Lee, 1989), exhibit perseverance in their speech (Perlock & Nelson, 2012; Roberts, Rice & Tager-Flusberg, 2004), and rarely use language to comment, describe events or acknowledge the listener (Wetherby & Prutting, 1984). They may also have difficulty in understanding and referencing thoughts and emotions during conversation (Tager-Flusberg & Caronna, 2007) and using language for social purposes such as developing friendships (MacKay, Knott, & Dunlop, 2007). Children with ASD may also demonstrate deficits in non-verbal communication skills. Joint attention (see "Glossary" in Appendix I for a description) is one such pivotal non-verbal communication skill that is impaired in children with ASD (Perlock & Nelson, 2012). Joint attention is defined as, "…use of gestures and eye contact to coordinate attention with another person in order to share the experience of an interesting object or event" (Mundy, Sigman & Kasari, 1994, p. 389). It consists of two parts- *responding* to bids of joint attention initiated by another person and *initiating* bids for joint attention to another person (Macduff, Ledo, McClannahan, & Krantz, 2006). Being a pivotal skill, joint attention influences development in other domains and is related to the future outcome of language and communication skill in children with ASD (Mundy & Crowson, 1997; Mundy, Sigman & Kasari, 1994).

Although language skills are also closely related to the communication and conversational skills, some children with ASD may not present problems in speech production and may even achieve a high score on a standardized language assessment

(Hobson & Lee, 1989; Tager-Flusberg & Caronna, 2007). However, in spite of these high scores, children with ASD may continue to experience difficulty in the functional use of language.

Statement of the Problem

Deficits in conversational skills of children with ASD are persistent and are particularly evident in settings where there are greater opportunities for social and peer interaction (MacKay, Knott, & Dunlop, 2007). These deficits pose difficulty in these children's learning and developing social relations and interactions with other peers/individuals (Loveland & Landry, 1986). This further impedes the social adaptation of children with ASD, and studies indicate that children with ASD are more likely to have fewer friends and are at greater risk for negative social experiences including shunning and bullying (Koning & Magill-Evans, 2001; Little, 2001; MacKat, Knott & Dunlop, 2007).

Considering the significance of conversational skills in the social functioning of a child, intervention and treatment programs targeting conversational skills are clearly necessary. Previous interventions targeting the conversational skills have employed several techniques including the use of video modeling (Charlop & Milstein, 1989; Nikopoulos & Keenan, 2007), scripts (Brown, Krantz, McClannahan & Poulson, 2008; Krantz & McClannahan, 1993,1998), role-playing (Goldstein, 1988; Goldstein & Cisar, 1992), and incidental teaching (McGee, Almeida, Sulzer-Azaroff, & Feldman, 1992).

Addressing motivation is important when designing interventions for children with ASD, as the literature suggests that children with various intellectual and developmental disabilities are "extremely unmotivated," (pg. 185) especially in situations where

demands are placed (Koegel & Mentis, 1985). This is also true for children with autism, who may be unmotivated and fail to demonstrate curiosity or drive to explore their environment in a way that is similar to their typically developing counterparts (Koegel & Egel, 1979). It has been hypothesized that this lack of motivation can be attributed to a long history of failure which in turn leads to a situation where any attempt to complete a task or demand either leads to "unrewarded or minimally rewarded outcomes" (Koegel & Egel, 1979; Koegel & Mentis, 1985, pg., 185). Such a lack of motivation in children with autism negatively influences their performance in various educational and learning environments. Further, in light of deficits in conversational skills along with a clear lack of motivation to converse, it becomes important to incorporate the motivation of children with autism within the design of the treatment procedure.

Like other skill acquisition programs for children with ASD, the intervention techniques try to use a child's preferences in the form of reinforcers or consequences for desirable behavior when implementing a treatment procedure for increasing conversational skills (Koegel & Koegel, 1995). This is typically achieved by providing preferred edible or leisure items (e.g., toys, candy etc.) contingent on the child's behavior. These reinforcers may not be related to the topic of the conversation.

Purpose of the Study

The purpose of the present study was to bring together the two important areas in the intervention literature of autism, to include (1) the significance of motivation and the importance of developing communication skills in children with autism and (2) systematically incorporating participants' interests as part of the intervention designed to increase their conversational skills.

In order to achieve this goal, two methods of preferences assessment were used in this study. First, the caregivers were interviewed by using the *Reinforcer Assessment of Individuals with Severe Disabilities (RAISD)* (Fisher, et al., 1996). This helped us identify the participants' highly preferred and least preferred items/activities. Second, a paired choice preference assessment (Fisher, et al., 1992) was completed by using the previously identified items. As part of this assessment, the participants were asked to make choices from the various items presented in a pair. The result of this assessment indicated two highly preferred items/activities and two least preferred items/activities. Once these items were identified, they were used to develop scripts to be used during the various study phases of the research. This two-step method of identifying preference ensured that the participants' preferred reinforces were incorporated in the study. In addition to this, non-preferred items/activities were also incorporated in the study to understand the difference in the participants' target behavior (i.e., scripted and unscripted conversation) in conditions using preferred items as compared to non-preferred items.

A non-concurrent multiple baseline design across participants was used to answer the following research questions:

a) Do scripts based on highly preferred items increase initiation in conversations in comparison to low-preferred items?
b) Do scripts based on highly preferred items increase scripted and unscripted conversational skills, including turn talking, responding to questions, asking questions, when compared to scripts based on low preferred items?
c) Is overall acquisition faster for topics that are preferred by the participants versus topics that are not preferred?

d) Is the generalization of conversational skill better for topics that are preferred by the participants versus topics that are not preferred?

Chapter 2: Literature Review

Children diagnosed with ASD who develop speech frequently continue to exhibit deficits in initiating and maintaining conversation with peers and other individuals (Paul, 2008). While the nature of this deficit is variable across children, such deficit has far-reaching consequences on their social skills, peer and sibling relations and overall social development.

This current literature review is divided into two sections. First, the concept of motivation and its significance in designing treatment and intervention programs is reviewed. Following this, the discussion will focus on the various intervention programs or strategies used to teach conversational skills to children with autism. Specific emphasis will be placed on the use of scripts and script fading procedures. This section will conclude with a discussion on the significance of the current research project and specific research questions.

Motivation

Keller and Schoenfeld (1950) were the first to describe motivation and drives in the behavior analytic literature. They conceptualized motivation as a relationship between environmental variables (also called *establishing operations, EO*) and their effect on an individual's behavior (see definition in Glossary, Appendix I). Michael (1982, 1993) further explained motivation or EO as an environmental variable that has two functions - a) altering the effectiveness of a stimulus as a reinforcer and b) changing the frequency of the behavior that is reinforced by that stimulus (see definitions in Glossary, Appendix I). States of deprivation and satiation, in addition to several other biological states like feeling hot or cold are prime examples of EO. In the literature, motivation is sometimes

called *Establishing Operations* (EO) or *Motivating Operations* (MO), implying that environmental events or stimuli can alter the motivation of an individual. For the purposes of this paper, I will use the term motivation to describe this construct.

Previous research indicates that motivation plays a significant role in the development and acquisition of language in typically developing children (Bijou & Bear, 1965; Skinner, 1957). Motivation is also an integral tool in the intervention programs for children with developmental disabilities (Sundberg, 2004) and is frequently incorporated in teaching programs. This is typically done by identifying preferred stimuli/events and designing a program that incorporates these stimuli/events with the ultimate goal of increasing the desired behavior. It is suggested that in order to use a participant's motivation for language intervention, the therapist must try to "capture or contrive the reinforcing effectiveness of an event" (Taylor et al., 2005, p. 386).

Use of motivation in intervention studies. An individual's motivation has been used in Functional Communication Training (FCT) (see definition in Glossary, Appendix I) (Brown, Wacker, Derby, et al., 2000; Carr, 1988; Carr & Durand, 1985), and for teaching requesting behavior (i.e., requesting for items or activities) in children with autism (Sundberg, 2004, Sundberg, et al., 2002). More complex skills such as task performance task performance (Charlop-Christy & Haymes, 1998), duration of social play (Baker, Koegel & Koegel 1998), social play with peers (Baker, 2000) and joint attention (Vismara & Lyons, 2010) have also been taught by manipulating a participant's motivation. The results of these studies indicated that once the participant's interests or "objects of obsession" were incorporated in the intervention program, there was an increase in the target behavior.

Although these studies targeted complex social behavior, one study looked at the effect of motivation on social initiation, which is one component of social interaction. Taylor, Hock, Potter, Rodriguez, Spinnato and Kalaigian (2005) included three children with the diagnosis of autism and assessed the effect of manipulating motivation by depriving the children of their preferred snacks. The authors then tried to understand the relationship of such a deprivation on the frequency of requests made by the participants towards other peers, who also had the diagnosis of autism. The participants were between the ages of four and ten. One participant used a voice output communication system (DynaMyte). All the participants used expressive and receptive language to answer questions, to label objects and pictures and to request for preferred items. However, this interaction was only limited to adults. The three "peers" included in the study also had autism and were within a 2-year range of the participant with whom they were paired. Once the participants and their peers were paired, three preferred snacks were identified for all the participants and their peers. During all the conditions, the participant and his peer sat at the table. During the motivation absent condition, both the participant and his peer had access to their snacks, which were placed freely on the table. During the motivation present condition, only the peer had access to the snacks. If the participant appropriately requested for the snacks, the peer was prompted to deliver a small piece of the snack to the participant. This prompt was gradually faded. During these conditions, the authors noted that the participants frequently used pointing, gestures or tapping on the shoulder of their peers to request the snacks as opposed to using verbal statements. In order to ascertain that the participants could verbally request for preferred snack, another motivation present session was conducted with adults as their peers. If the participant

requested the snack verbally, the adult therapist delivered the snack. If the participant used pointing or gestures, the adult therapist waited 15 seconds before modeling a verbal request for the snack. Peers were reintroduced in the motivation present condition with snacks after the participants had made ten verbal requests for each snack with the adults.

A follow-up session was conducted in which toys were used in place of a snack. A procedure similar to that described above was used to increase social initiations. The authors used reversal design to assess the effect of deprivation on the frequency of requests made by the participants towards their peers. The results of this study indicated that motivation significantly increased the verbal initiations and requests made by the participant towards his respective peer. Additionally, this skill was generalized to new peers and new items.

The study described above is the only study that has manipulated motivation to assess its effectiveness on social initiations in the form of requesting behavior. This study clearly underscores the influence of preferences and the importance of incorporating preference when designing an intervention program for children with ASD (Piazza, Fisher, Hagopian, Bowman & Toole, 1996).

Interventions for Developing Conversational Skills

Deficits in conversational skills are evident and widely prevalent in children with ASD. However, there is a lack of standardized intervention programs or curricula that can be individualized to target the specific area of deficit for a particular individual (Paul, 2008). Various intervention approaches targeting conversational and/or reciprocal communication skills have been reported in the literature and will be the focus of this review. Studies targeting more rudimentary forms of communication were excluded, as

they were not directly relevant to the current topic of the project. Intervention programs/techniques used to increase the conversational skills include self-management techniques (Koegel, Koegel, Hurley & Frea, 1992), video modeling (Nikopoulas, 2007), the use of operant techniques guided by a theory of mind approach (see definition in Glossary, Appendix I) (Chin, 2000) and the use of scripts (Brown, Krantz, McClannahan & Poulson, 2008; Krantz & McClannahan, 1993, 1998; Macduff, LedoMClannahan & Krantz, 2007).

Self-management technique. Koegel, Koegel, Hurley and Frea (1992) used self-management techniques to develop reciprocal conversational skills in four children with autism. They wanted to determine if this intervention could be applied in diverse settings (e.g., clinics, communities and homes) and also decrease disruptive behavior associated with social interaction. The targeted conversational or communication skill was defined as social responding by answering questions posed by others (e.g., parents, peers). Four children with expressive and receptive language at a 3rd grade level were included in this study. There were two additional selection criteria: first, the participants were consistently unresponsive to the verbal initiations made by others and second, the participants' typical response to verbal initiation was disruptive behavior. A multiple baseline design across setting and subject was used. Self-management training was conducted in the clinic and reinforcers were identified for each participant prior to starting the training. To begin, participants were taught to discriminate between correct and incorrect responses to a question. Clinicians demonstrated sample appropriate responses or answers to a question and taught the participants to subsequently record their correct responses on a wrist counter, which was provided to the participants in order

to keep track of their (participant's) correct responses. As part of the discrimination training, the participants were trained to count each correct response on their counter and to not count the incorrect or no response to the question. Once this training was complete, the participants were asked to wear the wrist counter on their wrist and they were similarly trained to press the counter for every correct response and to not press the counter for either an incorrect or no response. Initially, reinforcers were provided for every click. This schedule of reinforcement was thinned to a point where the participants were then reinforced after 30 to 40 correct responses. Following the multiple baseline design, the training was implemented in the community, home and school settings. Data was collected on appropriate responses which were defined as "any verbal response or appropriate attempt at a response that was related to the stimulus (question) and occurred within three seconds of the stimulus" (p. 346), inappropriate responses, disruptive behaviors (defined individually for each child) and accuracy of self-recording the data on the wrist counter. The results indicated that all four children engaged in greater frequency of appropriate responses across all settings. Additionally, participants also engaged in fewer instances of disruptive behavior when others initiated social interaction. Anecdotally, the authors reported that following this intervention, three of the four participants started to initiate conversations with others in their environment. Although answering and responding to others does not entirely constitute the complete dynamics involved in a conversation, it is certainly an essential piece. This study was able to demonstrate an increase in social responding following the intervention program. However, one of the significant limitations of the present study was a lack of assessment for the generalization of the newly acquired skill across novel settings such as a grocery

store, play ground etc., for novel individuals such as siblings, other individuals not participating in the formal intervention phase or for novel stimuli example posing questions that were not included in the intervention phase. Another limitation of this study is that it targeted only one aspect of the conversation, answering questions, and did not target asking questions or commenting during a conversation. These are essential for maintaining a conversation following an initiation.

Theory of mind: Operant technique. Employing the theory of mind approach, Hsiao and Bernard-Opitz (2000) used the operant technique to teach conversational skills to three verbal children with ASD. The authors believed that children with autism do not acquire "theory of mind" (Baron-Cohen, Leslie & Frith, 1985; Frith, 1989; Hsiao & Bernard-Opitz, 2000), which is the ability to take other individual's perspective into account. Due to this limitation, children with autism are unable to consider other individuals' perspectives in a conversational context. Without this essential feature, children with autism might experience difficulty with staying on a topic of mutual interest, talking too much or too little on a topic, repetitive statements or questions and difficulty taking turns in a conversation (Hsiao & Bernard-Opitz, 2000).

In their study, Hsiao and Bernard-Opitz (2000) hypothesized that if children with autism are taught to engage in conversation with other individuals, they might show gains in the realm of theory of mind. Three boys within the age range of five to seven years and their primary caregivers participated in the study. Caregivers served as the conversational partners during the baseline and treatment phases. Additionally, one six-year-old typically developing peer also participated in the study and served as the conversational partner for generalization sessions. A multiple baseline design across participants was

used and data was collected on the percentage of time participants spent in "shared interest with their caregivers and the percentage of responses that were within the context of the conversation topic" (Hsiao & Bernard-Opitz, 2000, p. 572). Additionally, the authors periodically assessed theory of mind (see glossary for a definition) using the "False Belief tasks" (see glossary for a definition). Following baseline, the training was initiated. At the end of nine sessions, the training was terminated irrespective of individual's performance during these sessions. As part of this training, the participants were taught five specific conversational skills. These included making a conversation, turn taking, listening, maintaining a topic and changing a topic appropriately. The participants were taught each of these components one at a time in the order specified above. The components were layered on top of each other such that when training the last component, the participants were practicing all the five components together. Each component was objectively defined and broken into measurable steps and behaviors, and the participants were considered trained if they met individual criterion for each component. In order to ascertain that the participants remembered training skills from previous sessions, the therapist asked them to recall their previous training sessions. Following the training, the caregivers were asked to reward the participants if they engaged in any desirable target behavior. The intervention was assessed for generalization after the participants had reached a specific criterion during intervention. Generalization was assessed in a novel setting, using a new topic of conversation and with a new conversational partner. For generalization in a new setting, the sessions were conducted in the participant's home. For generalization across new individuals, a peer

served as conversational partner, and to assess generalization across stimuli, new topics of conversation were used.

The results of this study indicated that following the conversational training the participants engaged in greater frequency of answering questions when compared to baseline. Overall, all the participants were able to maintain a conversation, change the topic of the conversation appropriately and did not engage in perseveration or unclear repetitive vocalizations during conversation. However, these results were variable across participants and only one participant was able to complete all the components of the training in the designated nine sessions. Data collected during generalization was available for one participant and indicated that the participant had successfully generalized the skill.

However, there were certain limitations to this study. First, the intervention was only conducted for nine sessions. Due to the limited number of sessions, only one of the three participants learned all five behaviors. Second, the generalization data was only available for the participant who was able to learn all the five behaviors. In addition, none of the three participants in the study showed increases in theory of mind. These limitations make it difficult to assess the effectiveness of this intervention for a larger population and highlight a need to provide greater attention to generalization in future interventions. Finally, the study did not incorporate the participant's motivation or preferences when identifying the topics of conversation, to be used in the study.

Overall, the intervention was effective in increasing adaptive communication skills in verbal children with autism, although, there are several limitations to the theory of mind approach. One of the most significant limitations in the theory of mind is that it does not

directly relate to nor address the conversational skills in children with autism. Children with autism who pass theory of mind tasks continue to show impairment in conversational skills (Hadwin, et al., 1997), and children who develop appropriate conversational skills following intervention do not show any gains on theory of mind test and assessment (Hsiao & Bernard-Opitz, 2000). Researchers believe that further research is needed to understand the relationhip between the theory of mind and social-communication skills (Hsiao & Bernard-Opitz, 2000).

Summary. The two interventions described above have been effective in developing conversational skills and social responsiveness in verbal children with autism. However, neither study was able to demonstrate effective generalization of the acquired skills. The first study did not assess generalization of the skills, and the second study could only demonstrate generalization of the skills for one of the three participants. Future research should address this limitation by incorporating generalization in the design of the overall intervention program. In addition to this, participant's interests were not incorporated in the second study by using various topics of conversation, and therefore future research should be extended the research to include participants' interest in the conversation.

Systematic application of scripts (see definition in Glossary, Appendix I), used along with principles of applied behavior analysis (such as prompt and prompt fading, reinforcement strategies etc.), has been effective in targeting conversational skills in verbal children with autism. The following section discusses the literature on the use of scripts along with other components targeting the development of conversational skills.

Interventions Using Scripts

Scripts can be described as an orchestrated order of events or behaviors (Goldstein & Cisar, 1992). Schank and Abelson (1977) first used the term *script* to describe the method of organization used by individuals for routine situations. It is hypothesized that "preschool children organize experiential information in a script like form that defines the order of events within familiar situations or themes" (Goldstein & Cisar, 1992, p.266). These scripts can be used to facilitate or initiate interactions in familiar settings in the future. For example, a script for greeting a guest at your house might include initiating the interaction by stating "Hello", "How are you?" or responding to the guest's greeting ("How are you?") by saying "I am fine." Depending upon the response, this exchange might continue or end.

Typically developing children tend to learn and follow everyday scripts, like greeting guests, while children with ASD often continue to experience difficulties in learning these and other everyday social scripts. Charlop and Milstein (1989) suggested that certain characteristics of children with ASD like excellent rote memory and echolalia (see definition in Glossary, Appendix I) could be helpful when children with ASD are learning these scripts in which, they are trained on specific verbal responses called "scripted conversations".

It should be noted that in script based interventions, scripts are usually one piece of an overall intervention design. While scripts are the focus of the investigation, additional variables are also examined to understand the overall effectiveness of the script-based procedure. These other variables can include the type of scripts (audio vs. textual script) or the effect of parents as therapist (as opposed to a trained therapist) in the script training

of their children and the parents' influence on the overall acquisition of conversational skills. Several studies have designed intervention programs by incorporating scripts along with the use of role play and social scripts (Goldstein & Cisar, 1992; Loveland & Tunali, 1991), with the use of scripts with video modeling (see definition in Glossary, Appendix I) (Charlop & Milstein, 1989; Sherer, et al., 2001), and with the use of scripts and script fading procedures (Brown, Krantz, McClannahan & Poulson, 2008; Charlop-Christy & Kelso, 2003; Krantz & McClannahan, 1993, 1998; Regon & Higbee, 2009; Sarakoff, Taylor & Poulson, 2001; Stevenson, Krantz & McClannahan, 2000; Wichnick, Vener, Keating, & Poulson, 2009).

Role-play using socio-scripts. Goldstein and Cisar (1992) studied the use of socio-dramatic scripts and the effect of teacher prompting on the social interaction of preschool participants from a developmentally integrated preschool program. Nine children from this program participated in the study. The participants were divided into triads, which consisted of two typically developing children (peers) and one child exhibiting autism-like characteristics (target child). Each triad was taught one script where each participant was assigned one of the three roles described in the script. The participants were taught ten associated target verbal and non-verbal behaviors for their assigned role. Group training sessions were conducted where the participants followed their role. The study controlled for teacher prompting in the various conditions by coding them in several categories as general prompts, specific prompts, physical prompts and praise. Data was collected on four social interactions: targeted social behavior (behaviors associated with each role), related social behavior (other theme-related verbal and non-verbal behaviors), unrelated social behavior (other non-verbal and verbal behaviors that were not related to

the scripts used in the study) and non-social utterances (utterances directed towards the teacher or away from the other children). Interactions were observed between peers and target children during structured free play where the teachers introduced the play and assigned the roles. A multiple probe design across scripts, replicated across three triads, was used to examine the effects. Although conversational skills were part of the focus in this study, results indicated an increase in theme-related conversation following the script training for the three target children. This increase in reciprocal social interactions and conversation was predominantly theme-related or centered on the script.

This study also assessed for generalization of the intervention. Generalization across novel individuals was assessed by regrouping the triads. However, the scripts used during interactions among the triad members remained unchanged. The results of the generalization data indicated that with novel peers, the target children continued to demonstrate increased reciprocal social interaction and conversation. A limitation of this study is that it did not assess for generalization of this new skill across other play themes or roles. Future research should address this limitation by assessing generalization in all the three domains, i.e., with a new individual, a new setting and a new stimulus.

Scripts and video modeling. Video modeling is a technique where the target behavior is demonstrated in a video (Bellini & Akullian, 2007) and an individual watches the video. This technique can be used with children and adults alike. It has been demonstrated to be effective in the acquisition of a wide variety of skills including conversational skills (Bellini, & Akillian, 2007) in children with autism.

Charlop and Milstein (1989) used video modeling along with scripts to teach conversational skills to children with ASD. Three six- and seven-years-old boys with

autism participated in the study. All the participants were verbal and were able to answer simple questions in three- to four- word phrases. However, none of the participants engaged in spontaneous conversation, which was assessed during the baseline condition. During baseline, the therapist tried to engage the participant in a conversation by playing with a related toy and presenting the first line in of the scripted conversation. The therapist responded to any comments or questions made by the participant. For the treatment condition, the scripted conversations were presented in the form of videotapes where two familiar adults modeled the conversation. Each conversation consisted of seven lines. Of these, one adult spoke three lines and another spoke four. The scripts were specific for each child and were based on the toys identified by the parents as preferred for their child. During intervention, the participant and therapist watched the video of the scripted conversation three times. Following these viewing, the participant was tested for the acquisition of the conversational skills as demonstrated on the video. During these probes, the therapist started the conversation with the first line. The participant was expected to speak the conversation seen on the video. In total, the therapist spoke four lines and the participant spoke three lines in a conversation. The responses included answering and asking a question, except for the first line. The number of training sessions required for the three participants, before they were able to engage in the scripted conversation, varied from 3 to 20 sessions. Once the participant was engaging in the scripted conversation, the authors conducted the generalization probes. These probes were similar to the baseline sessions. Generalization was assessed using unfamiliar adults and peers with autism, different topics of conversation, and in a different setting which in

this study was the yard. The generalization probes were completed two to five days after the participant had met the criterion for completing the intervention.

The results from the intervention indicated that all the participants were able to effectively acquire scripted conversational speech following the use of video modeling. Additionally, the results from the generalization probes were mixed and variable across participants. Although the participants exhibited some generalization of the newly acquired skill, one participant did not demonstrate generalization across novel peers, also with a diagnosis of autism. The other two participants only demonstrated some generalization and had greater difficulty with generalization across new scripts. This indicates that the results should be interpreted with caution, as generalization was not very successful.

Sherer, Pierce, Paredes, Kisacky, Ingersoll and Schreibman (2001) conducted a study to assess the difference in the effectiveness between video modeling and self-modeling (see definition in Glossary, Appendix I) on the acquisition of conversational skills. Self-modeling is defined as " a procedure in which people see themselves on video tapes showing only adaptive behavior" (Dowrick 1983, p. 105). Five children with autism ranging in age from 3 to 11 years were included in this study. Additionally, six typically developing children were included in the study and served as the conversational models for the video. A list of twenty everyday questions that the parents wanted their child to respond to was compiled (e.g., What school do you go to?) A random set of eight questions and appropriate answers was assigned to the video with typically developing children as models in the "other video" and with the participants as models in the "self-video." Four questions were included in the generalization condition. The appropriate

behavior chain for the other video included: the therapist asking the model a question, the model responding to the question, the model asking the therapist a similar question and the therapist responding to the question with an appropriate answer. The appropriate behavior chain for the self-video was the same. However, the videos were edited from previous recordings to show the participants engaging in a conversation and responding to the question asked by the therapist.

A combined multiple baseline and alternating treatment design was used in which the participants were exposed to each treatment condition on alternate days. The intervention was completed at home where the participants were required to watch the videos (either self or other) three times prior to going to bed. They did not watch the video at any other time during the day. The next day, the therapist asked the questions viewed in the video the previous day. This process continued until the participants reach a criterion of 100% correct responding or no acquisition over several weeks (not specified by the authors). Generalization probes were completed with new questions that were previously identified, in a new setting (i.e., probes conducted in setting other than treatment setting or where the participants viewed their videos), and with new individuals who included a family member and age and gender matched peers.

The results of this study indicated that the use of video was an effective intervention for the acquisition of conversational skills for three of the five participants. For successful participants, both the other- and self- videos were equally effective in the acquisition of appropriate responding. Additionally, for unsuccessful participants, neither the other- nor the self- video was effective in the acquisition of appropriate responding. In terms of generalization, data was available for two of the five participants. The results indicated a

similar pattern such that the responses of the two participants generalized across new settings and with new individuals; however, the participants were not able to provide an answer to the new questions.

Although several studies have demonstrated the effectiveness of using video modeling on the acquisition of various skills in children with autism, further research is needed to completely understand the effectiveness of this intervention technique. The effectiveness of this technique is influenced by the type of model used in a video, i.e., self, peers or adults, and it is difficulty to conclude who serves are a better model (McCoy & Hermansen, 2007; Sherer, et al., 2001). This might make the intervention ineffective for certain children. Second, individual characteristics of the children for whom these videos are made (e.g., visual performance, willingness to attend to the videos, imitation and attention skills) in addition to the characteristics of the videos (e.g., length and number of viewing of the videos), the use of additional technology or techniques in the video such as zooming in and out, providing background narration or pace of demonstration) are variables that might make the video modeling technique ineffective with certain participants (Nikopoulas & Keenan, 2007; McCoy & Hermansen, 2007). Systematic research is needed to empirically identify the influence of the above-mentioned variables on the overall success of video modeling with an individual. Finally, it should be noted that there are various ethical and legal concerns in using video of other individuals. Due to these limitations, this technique was not considered for the present research project.

Summary. The above research (Sherer, et al., 2001) used scripts and videos in teaching conversational skills to children with autism. The intervention using scripts were

effective in that they demonstrated acquisition and maintenance and/or generalization of the acquired skills for some of the participants. However, the study did not fade the scripts or the videos used during intervention. This is a limitation because the participants might become dependent upon these stimuli (Krantz & McClannahan, 1993).

Interventions with Script and Script Fading

The studies described above used external stimuli like teachers, videos, scripts etc. but did not include a procedure to reduce the dependence of the participants on these stimuli in the intervention. The interventions using the above-mentioned external stimuli need to systematically transfer the stimulus control to natural elements in the environment (Odom & Strain, 1986).

In order to address this limitation, an intervention procedure that does not use prompts from the teacher or other stimuli needs to be incorporated. Additionally, to reduce the participant's dependence on these stimuli, it is important to systematically fade these stimuli from the environment. Script fading (see definition in Glossary, Appendix I), is a procedure that aims at addressing this limitation and there by reduces the participant's dependence on other stimuli.

Researchers have closely examined the use of scripts and script fading procedures in teaching functional conversational skills. Script fading, as the name suggests, is a procedure in which the scripts used during the intervention program are systematically and gradually faded from the participant's environment so that the participant is no longer dependent upon the scripts. This procedure successfully addresses the participant's prompt dependence or stimuli dependence, which has not been addressed in previous studies using scripts.

Krantz and McClannahan (1993) were the first to assess the use of a script fading procedure on the social initiation of children with autism towards their peers. Four participants between the age of nine and 12 years were included in this study. All the participants in the study had some functional expressive language, although it was rarely used appropriately. Sometimes the participants spontaneously requested an item or an activity (e.g., "I want a cookie") and were able to respond when addressed by an adult. The participants rarely initiated conversation with others apart from requesting items or activities. The researchers examined scripted and unscripted initiations towards peers in the context of three art activities. The topics for the scripts were based on activities that were recently completed, were a present activity or were a future activity. Prior to intervention, participants were given written instructions of "Do your art" and "Talk a lot" and the frequency of their initiations and responses were recorded. During the baseline condition, the participants' numbers of initiations and responses were either low or zero. The intervention included ten statements or questions (e.g., "[Name], did you like to [swing/roller skate/ride the bike] outside today?") The scripts were textual and the participants were required to read the scripts. The teacher, who was the prompter for this study, stood behind the participants and, if needed, prompted the participants to use a pencil to point to the script and read it aloud. If necessary, the teacher physically prompted the participants to face the other peer. The teacher continued to provide the prompt until the participants read the script. After the participants read the script, they were prompted to place a check next to the script indicating that the script was completed. Once the participants were reliably reading the texts without requiring physical prompts from the teacher, these prompts were faded. The prompts were faded at

different times for each of the four participants. After the participants were consistently initiating interactions with peers in the presence of the scripts, the process of script fading began. This fading was done in five phases and started with the last word in the sentences, up to the first word. As the participants continued to initiate the interaction, the fading process continued until only a period was left from the sentence.

Generalization was concurrent with the treatment phase. Generalization was carried out in a new setting, with a new adult (a new teacher), at a different time of the day and with new materials (puzzles). Generalization was conducted in two phases. In the first phase (sessions one to three), the participants were given a piece of paper with written prompts “Do your puzzle” and “Talk a lot,” along with their work material. The teacher also guided the participants to point at these prompts after following which the teacher did not provide any further prompts. In phase two of the generalization (sessions four to six), the participants were provided with the faded script along with written instructions. For example, if one of the participants was at step five of the fading process in the treatment session, then the generalization sessions included scripts at step five of the fading process. Similarly, if another participant was at step three in the fading process, their generalization session included scripts at step three of the fading process.

The results of this study indicated that following the script-based intervention there was an increase in the mean number of initiations and responses made by the participants. At the start of the intervention, these initiations and responses were primarily scripted in nature. However, as the scripts were faded, there was an increase in the number of unscripted initiations and a decrease in scripted initiations. Overall, the participant’s initiations and responses were on an upward trend. In terms of generalization, it should be

noted, that the authors pre-programmed generalization by teaching the skills in diverse settings, with novel individuals and using different materials. The results from the generalization sessions indicate that in the first phase of generalization, the participants' initiations were low. However, following the introduction of the fading process in phase two, there was an increase in the number of social initiations made by the participant.

Although these results might seem promising, there are some limitations. First, the results do not reflect true generalization of the responses since cues and prompts, in the forms of written instruction and scripts, were present in all the sessions. Due to this, it is difficult to ascertain if the participants' responses during generalization sessions were due to true generalization or due to prompt dependence. The results from the generalization sessions should be interpreted with caution, and further work needs to be directed towards developing a thorough generalization process that will assess generalization without the presence of scripts. Second, this study did not look at the interest of the participants when developing scripts for conversation. Future research need to address this limitation by systematically including the child's interests and preferences during the intervention.

The previous research focused on initiations and responses, which is only a part of the overall complex conversational process. Stevenson, Krantz and McClannahan (2000) extended on previous research by using audio taped scripts along with script fading procedure to develop conversational skills in four participants with autism (ages 12, 15, 13 and 10 years). In this study, the authors also employed for the first time an electronic device for emitting scripts. By using an electronic device to emit the scripts, it did not require pre-existing reading skills in the participants which was a requirement in the

previous research. The participants in this study had limited expressive language and primarily used it to request items (e.g., “I want drink”). The participants had learned to greet others (e.g., “Hi, Mom,”) and use other polite phrases and words (e.g., “ please”). The participants responded with a single word or short phrases to the question posed by others. None of the participants engaged in spontaneous conversation. The scripts were based on 25 non-social activities and five social activities, randomly selected based on the activities completed by children of this age range in the clinic. An electronic card reader, Language Master, was used to play the scripts that were recorded on the Language Master cards. Prior to using the electronic card reader, the participants were trained to use the card reading device and imitate four- to five- word audio taped scripts with at least 80% accuracy. Training scripts were different from the scripts used during the intervention.

It should be noted that each Language Master Card consisted of one line (or a script) from the whole scripted conversation. Every time the participant ran the card through the card reader, it emitted one script and the conversational partner responded to the script emitted by the participant.

Two baseline conditions were used. During baseline I, each participant was present in the room with their instructor along with the materials for five non-social tasks and the participant’s picture schedule/activity book. During baseline II, everything was same except the picture schedule was removed. Following the two baseline conditions, the intervention was initiated so that all the material from the baseline I sessions was present, in addition to Language Master and Language Master cards with prerecorded scripts. Pictures of five nonsocial activities were placed on a display board along with a picture

of the Language Master Cards. The Language Master Cards were placed on the participant's lap right before starting the intervention. As part of the intervention, the teacher used graduated guidance from behind, to open the activity book/picture schedule, select the picture from the board, mount the picture on the page to which the activity book was open, obtain the material for the activity, complete the activity, run the Language Master Card through the card reader and repeat one scripted sentence emitted by the device. This was then followed by returning the materials to its original place, returning back to the table with the schedule and end with turning the page. If the participant did not repeat the script after sliding the card through the card reader, no verbal prompt was given. Instead, the teacher prompted the participant to slide the card again using a manual guidance. This prompt was provided one to three times for each of the participants and verbal prompts were never used.

In order to reduce the level of support or prompt provided by the teacher to complete the behavior chain described above, most-to-least prompting procedure was used. The various steps in fading process included: graduated guidance followed by spatial fading, shadowing, and, at the end, increasing the distance between the participant and the teacher. If the participant did not respond accurately with reduced level of prompting, the teacher reversed back to the previous higher level of prompting.

After the participant repeated the script (one sentence of the entire scripted conversation), the teacher responded to the statement with additional elaboration. The teacher never responded with a question. The participant and the teacher were required to complete four exchanges. At the end of these exchanges, the teacher modeled a closing statement, which marked the end of the conversation. Once the participants completed the

tasks, and imitated the audio script without any prompting, the scripts were faded. Script fading was done from the end of the script to the beginning of the script, by deleting the last word in the script such that the device did not emit the deleted word. In addition to fading the scripts, the pictures of Language Master Cards, the binder holding the card, and the board with the pictures of Language Master Cards were also faded. The pictures of Language Master Cards were faded by cutting away small portions of the photograph until the whole picture was removed. The card holder and display board were faded by removing the card holder and half of display board in one session and removing the other half of the display board in the next session. Once the fading was complete, the materials present in the room were identical to the baseline II condition.

During this study, data was collected on the scripted, unscripted and non-interactions. Scripted interactions were further differentiated as scripted 1 and scripted 2, based on the script that was most recently used. A continuous event-recording system was used to collect data, and a multiple-probe design across four participants was used to evaluate the intervention and its outcomes. Prior to the intervention, three of the four participants did not engage in any scripted or unscripted interaction with the teacher present in the room. Following the intervention, there was an increase in the number of scripted and unscripted interactions, which demonstrated the effectiveness of the intervention on the conversational skills of children with autism. However, there are a few limitations to this study. First, the participant's interest was not included when selecting various topics for scripts. Second, generalization was not assessed in this study which indicates that the results from the intervention should be interpreted with caution. Future research should address these limitations.

Sarokoff, Taylor and Poulson (2001) furthered the use of script fading by using naturally embedding textual stimuli such as, the word "skittles" on a skittles package. Two children (ages eight and nine years) with autism were included in this research. The participants served as conversational partners for each other. Each of the participants could read at least 50 sight words. The scripts were based on two snacks and one video game. These were randomly selected because children their age usually like these items. Each item was placed on a letter-sized paper that displayed the textual script. The script consisted of six to seven sentences about the item. Each sentence began with the name of the item. For example, for the item name "skittle" the sentences would read, "Skittles are my favorite." Each participant was given one script on a common stimulus such that the two scripts corresponded with one another, and the children were having a conversation with each other.

During baseline, the participants were seated across from one another along with the snack or video game. They were given the verbal instruction "have a snack" or "play video games" which also signaled the start of the session. The participants could choose to consume the snack or play with the game. The sessions were 3-minutes in duration. During the intervention, the scripts were introduced. The participants sat across from each other and followed the scripts. They consumed the snack or played with the video game. Only if it was written in the script i.e., "Let's eat our snacks," a gestural prompt was used to direct the participants to follow the script. No verbal prompt or verbal model for the statements was provided.

Script fading began after the participants were able to read their script without any prompt for two sessions. A five-step fading process described by Krantz and

McClannahan (1993) was used to fade the script. Data was collected on the number of scripted and unscripted statements emitted by each of the participants. A multiple baseline design across three sets of stimuli (two snack and one game) design was used. The authors assessed for generalization at one month and three months following the intervention. Six, three minute sessions were conducted using novel stimuli and novel peers. In sessions with novel stimuli, new snacks in their packages were provided and in sessions with novel peers, an unfamiliar peer was included. Furthermore, in sessions with novel stimuli, no scripts were present, and, in sessions with novel peers, only peers were provided with scripts. In addition to this, sessions were also conducted in which the embedded textual stimuli were not present and the adult was not present in the room.

The results of the study indicated that compared to baseline, the number of scripted and unscripted interactions increased for both the participants following the intervention. Additionally, the intervention effectively generalized to novel stimuli and to novel conversational peers such that the participants continued to use scripted statements and/or the sentences that they were taught to say. Furthermore, in the conditions in which the instructions were removed and the adult left the room, the participants conditioned to engage in scripted conversation.

One major limitation of this study relates to generalization. The authors did not assess the generalization of the acquired skill in a new setting, which indicates that all the future research should extensively assess for generalization across new people, new stimuli and new settings.

A more recent study by Brown, Krantz, McClannahan and Poulson (2008) extended the use of script fading to include increasing verbal interactions and sustaining

conversational speech in three participants with a diagnosis of autism between the ages of 7 and 13 years. All the participants in this study used spoken language to communicate but exhibited difficulty with verbal initiations and sustained conversation. All the participants had extensive experience with behavior analytic teaching and some experience with script-fading technology. Additionally, all the participants could complete simple classroom instruction or directives without any assistance. The participants were reported to exhibit low levels of stereotypical movements.

In this study, three community settings (e.g., a convenience store, a sporting good store and a videotape rental store) were used for pre- and post-intervention sessions. The intervention was conducted in a mock community setting (i.e., classroom setting designed to look like a convenience store, a sporting goods store and a videotape rental store).

As part of this intervention, a token economy reinforcement system was incorporated in which the participants earned tokens for each verbalization. However, prior to incorporating this system into the intervention design the participants were trained on the reinforcement system. This was completed with a picture-labeling task where the participants earned a token for each picture labeled correctly. After ten tokens were earned, the participants were able to exchange them for a preferred snack. Following this, the participants were trained on using the "mechanical counter." This counter was used to keep track of their responses. At the start of this training, if the participants answered the question and pressed the counter, they earned the token. If the participants failed to press the counter, the teacher manually guided the participants to press the counter and no

token was delivered. The training continued until the participants were correctly counting the responses on their counter during a single session.

Following this training, a "stimulus pre-teaching" was initiated. This training was conducted prior to completing the baseline in the natural settings. The purpose of this training was to ensure that the participants could identify all the stimuli that would be used and presented during the intervention. A total of 54 stimuli were used, nine on which were generalization stimuli. A teacher sat opposite the participants and presented the stimuli one at a time by asking the question "What is this?" A token along with descriptive praise was delivered for each correct answer. For each incorrect response, the teacher provided a correct response and no token was delivered. This training continued until all the items were correctly labeled in one session.

A third training was completed prior to collecting baseline data. A "reading pre-teaching" was completed with each participant. As part of this training, all the participants were trained to read all the words to be used in the scripts. In total, 93 words were included in this training. Flash cards with a single word printed on them were used for the training. The participant was presented with a single word one at a time. If the participant identified the word correctly, a token along with descriptive praise was provided. Additionally, for every wrong response, the teacher provided the correct response and no token was delivered. The training continued until the participant read all the words without any prompts or correctly in a single session. The time spent on training was variable across participants.

Following these trainings, baseline data on conversational performances of the participants were collected in the three natural settings, which were the community

stores. A conversational partner was present within 1.5 meters of the participants at all times. During this time, the participants were free to explore a designated section of the store. No programmed consequences were employed during these sessions and each session was five minute in duration.

Following baseline, a response-contingency modeling was initiated in the mock stores. This phase was similar to baseline in the community stores, however, following the contingency model, the conversational partner emitted an appropriate conversational response following a communicative statement emitted by the participant. No tokens were delivered for statements emitted by the participants. After the target behavior of the participants stabilized in this phase, the script-fading intervention was initiated for each of the participants. This intervention was initiated in one setting at a time. During intervention, the conversational partner continued to stay at a distance of 1.5 meters. The printed scripts were attached to each stimuli. If the participants did not read the printed script either within 30 seconds of entering the store or within 30 seconds of the last interaction, the conversational partner manually guided the participants to point to the script. The participants were awarded with points for every script that was emitted without any prompt. At the end of the session, the points were exchanged for preferred snack. After the participants were able to emit at least ten scripted responses without the prompt for reading the script, no additional prompts were delivered for the duration of the study. Once the participants met this criterion, script fading was started. The scripts were faded from the last word to the first word. These final scripts were then removed from each stimulus so that at the final step of the script fading process, no script was present on either of the stimuli. After stable responses were recorded in all the three mock

community settings, post-intervention sessions were completed which were identical to the pre-intervention sessions.

Multiple baselines across setting design was used to assess the effect of script fading and reinforcement strategy on the conversational interactions with the assigned conversational partner. Data was collected on the scripted, unscripted and generalization interactions. Nine generalization stimuli were used to assess generalization across novel stimuli in the response-contingent modeling and script-fading phases. Generalization stimuli were randomized across sessions such that within three sessions, each of the stimuli was present in the mock store at least once. If the participants made any comment or appropriate conversational statement referring to the generalization stimuli no points were delivered. However, the conversational partner responded appropriately to the comment.

The results of this study indicate that following the treatment there was an increase in the number of scripted and unscripted interaction emitted by the participants. There was also an interest in the interaction related to the generalization stimuli. They were called the generalization interaction (i.e., interaction referring to one of the generalization stimuli.)

There are certain limitations to this study that need to be addressed in future research. First, the generalization of the newly acquired skill should also be assessed in novel settings, which in this study can be other stores or community settings and with novel conversational partners. Second, this study incorporated participants' preferred reinforcers but did not relate them to the scripts. One way in which this could have been addressed is by including preferred items in the store.

In previous research with script fading, either adults or peers have been appointed as the conversational partners. Reagon and Higbee (2009) expanded the applicability of script fading procedure to a natural setting by incorporating parents as conversational partners. Three children between the ages of two to six years with the diagnosis of autism participated in the study. The participants possessed strong verbal imitation repertoire but had limited conversational initiations and exchanges. This was determined by one, three minute observation of a play situation with the participants' caregivers. The setting of the research was the participants' homes and the biological mother of each of the participants conducted the sessions.

The scripts were based on three preferred toys identified by completing a brief multiple-stimulus without replacement (MSWO) preference assessment (Carr, Nicholson & Higbee, 2000). One of these preferred toys was used during intervention and the other two toys were used for generalization sessions. This selection was done randomly. The toys used in the study (both treatment and generalization) were not available outside of the study to control for satiation.

The script associated with each of the toys was recorded on a button-activated recorder that was placed either inside or on the target toy at the start of the session. Scripts were not created for generalization sets of toys. Prior to starting the intervention, each mother trained the participant to use the button-activated recorder. During this training, the relevant recorder for each toy was placed either inside the toy or next to the toy. Manual guidance along with verbal praise was used to teach the participant to press the button on the recorder. If the participant failed to repeat the script emitted by the recorder, the mother provided a verbal prompt "say" followed by a prompt to press the

button. If the participant did not repeat the script, the mother provided a complete verbal model by emitting the script herself. Following this, the mother repeated the manual guidance to press the button. This process was continued until the participant repeated the script emitted from the recorder. During this training, the scripts were systematically faded by removing the last word from the script. This fading continued until no script remained in the recorder. The teaching continued until the participant was able to use the recorder without any prompt for three consecutive sessions.

Following this intervention, a baseline session was conducted. During the baseline session, the mother cleared the floor of distracter toys and placed the target toys on the floor. The mother was instructed to play with the participant and was asked to respond if her child initiated conversation. No scripts were used during baseline.

Following baseline, the intervention was initiated. During the intervention, three scripts were developed for the target toy. After the start of the session, if the participant did not press the button for 15 seconds or if 15 seconds had elapsed from the last pressing of the button, the mother manually guided the participant to press the button on the electronic voice recorder. Script fading began after the participant emitted all three scripts for two consecutive sessions without any prompts from the mother. Script fading began for all three scripts at the same time and started by eliminating the last word in the script. This process continued until the recorder emitted no words.

A multiple baseline design across participants was used to assess conversational exchange with mothers as the participants' conversational partners. Additionally, generalization across novel stimuli was assessed. Data was collected on scripted and unscripted verbal initiations made by the participants. The results of the intervention

indicated an increase in the frequency of unscripted interactions across all three toys. Furthermore, the authors anecdotally noted that the participants increased play with their caregivers following the intervention. The results from generalization stimuli were variable across participants, although when compared to baseline rates there was an increase in the scripted and unscripted verbal initiations made by each participant. A closer look at the generalization data indicates that one of the participants demonstrated an increase in unscripted initiations that gradually declined until a new set of toys was introduced. After the new toys were added, unscripted initiations increased which lead the authors to hypothesize that the participant was probably getting bored or was satiated with the present toy and there by led to a decrease in the unscripted initiations. Performance for participants two and three was similar. Following the introduction of the intervention, unscripted initiations increased during sessions with the generalization set of toys.

Although authors demonstrated some generalization of the newly acquired skill, to further strengthen the results of this study, future studies should assess generalization with novel individuals like other family members or unfamiliar adults and in novel settings like day care, play ground etc.

Wichnick, Vener, Keating and Poulson (2010) focused on the unscripted initiations and novel utterances emitted by the participants while assessing the effect of script fading procedure on the participant's initiation towards peers. For their study, the authors defined novel initiations as any utterance that had never been emitted by the participant throughout the study and subsequently scored as an unscripted initiation. Unscripted initiation is "any statement or question that differed from the scripts by more than

conjunctions, articles, prepositions, pronouns, or changes in the verb tense" (Wichnick, Vener, Keating and Poulson, 2010, p. 4).

Three participants with a diagnosis of autism were included in this study. The participants were between the ages of four and six years. The participants exhibited limitations with their conversational and spontaneous language and primarily used expressive language only to request for preferred items. In addition to this, the participants did not initiate any interaction with peers and restricted their interaction to adults who were their teachers.

The participants served as conversational partners for each other and the session began with all the participants seated at the table. The participants followed an activity schedule, which consisted of academic activities. The activities were randomly selected and did not include participants' preferences. The activity schedule also included written prompts to share the toys with the friends. Each participant was provided with a bin, which consisted of ten Ziploc bags containing one toy each. Of these ten toys, seven toys served as teaching toys and three toys served as generalization toys. A pre-recorded script was present in the bags containing the teaching toys. These scripts could be played on a voice-over-recording device. In the bags containing generalization toys, no scripts were present. Sessions consisted of ten trials of sharing the toys for each participant. A trial began when the researcher provided the verbal statement "Share toys with your friends." A token system was incorporated as the motivation system for engaging with other peers. The tokens were awarded for each initiation completed without any prompt. The participants could exchange the token for preferred snack or activities at the end of the session.

During baseline, the participants sat at the table with the activity schedule and their respective bins of toys. During this condition, scripts were not provided with any toy and the trial began after the researcher asked the participants to "Share toys with your friends." During the intervention, the audio scripts were added to seven target toy bags. For each participant, seven scripted sentences were developed which consisted of three to five words. Each sentence was considered an individual script. When training the participants, hand-over-hand manual guidance was used to teach them to obtain the toy, share it with the peer, press the button on the voice activated device and emit the script. This prompt continued to be provided until the participants repeated the audio script. Script fading began after the participants emitted all the seven scripts without prompts from the researcher for three consecutive sessions. The fading began from the end to the beginning by deleting the last word of the script first. The fading process continued until no script was emitted from the recorder.

Generalization across novel stimuli was assessed throughout the study. The generalization stimuli consisted of three toys placed in the Ziploc bag without the script. Data was collected on all the response measures associated with the generalization stimuli. Additionally, for the generalization stimuli, the participant's initiations were neither prompted (i.e., no hand-over-hand guidance was provided) nor reinforced (i.e., no tokens were delivered for appropriately initiating the interaction). However, it was noted that one of the participants in the study was responding differently towards the target and generalization toys. For this participant, one word from the script was added with the generalization toys. The word was the first word in the sentence.

A multiple baseline design across participants was used to assess the effect of script fading on the social initiation towards peers in children with autism. Generalization across novel stimuli was assessed throughout the study. Data was collected on scripted, unscripted and novel initiations. The results of the intervention indicated that the script fading procedure was effective in increasing participants' overall initiation towards peers. Additionally, as the script fading process started, unscripted initiations increased and stayed at high rates. Novel utterances were graphed on a cumulative graph and the results indicated that following the intervention novel utterances continued to increase. However, the authors reported that initiation towards peers for generalization toys did not increase systematically with the introduction of the intervention. However, as the intervention continued to be implemented, initiations increased for generalization toys.

The overall results of the intervention were consistent with the previous studies in demonstrating the effectiveness of the use of scripts and script fading procedure to increase scripted and unscripted interactions. In addition to this, the research further demonstrated an increase in novel utterances and differentiated these from unscripted interactions. It should be noted that generalization was only assessed across novel stimuli, which in this study were three novel toys. Future research should assess generalization across novel individuals, for example new peers and novel settings, for example other settings.

Wichnick, Vener, Pyrtek and Poulson (2010) extended this research by focusing on participants' responses to the initiations made by other participants. The participants from their previous study (Wichnick, Vener, Keating & Poulson, 2010) participated in this study. At the end of the previous research, all the participants were emitting unscripted

initiations. However, they were not responding to the statements directed toward them. Like the previous intervention, each participant was given a bin with ten Ziploc bags which consisted of toys. The toys were randomly selected and did not include participants' preferences. The researchers for the current study labeled an equal number of bags with the names of other participants. For example, the bin for participant #1 consisted of five Ziploc bags with the name of participant #2 and five Ziploc bag with the name of participant #3. This was done to indicate the target peer to share the toys with. If needed, manual guidance was used to prompt the participant to obtain the bag, share the toy with the peer and emit the initiations response. The manual guidance was gradually faded.

The sessions were conducted during a tabletop activity. The session began when all the participants were seated at the table. They followed an activity schedule that consisted of various academic activities. A written prompt, "Share toys with friends." was included with each of the activities and the trial began after the participants could see the prompt.

After sharing the toys with their peers, the participants set a ten second timer indicating the duration of interaction required. At the end of this ten-second duration, the participants were prompted to take the toy back from their peers and discard the toy in the bin which marked the end of a trial. Each participant was required to engage in ten such trials which was considered one session. Similar to their previous research, the authors of the current study used a token economy as a motivational system for emitting an initiation and response to an initiation.

The baseline condition was similar to the previous research where each participant was provided with one bin that consisted of 10 Ziploc bags each containing one toy.

During this condition, scripts were not present in the bags. In addition to this, only participants' initiations were reinforced by the individualized token system.

Following baseline the intervention was initiated. During the intervention, a participant picked up the bag and gave it to the other participant (the target participant). The bag contained a toy along with a voice-over-recording device that contained a pre-recorded script. The target participant receiving the bag was manually guided to open the bag and press the button of the recording device until the script was emitted. The scripts were responses to the initiations made by the participants. The target participant was required to emit the script played from the voice-over-recording device and the other participant was given a token for every four unprompted initiations. No scripts were provided for initiations in this study. If the target participant did not emit the script, manual guidance was provided until the participant emitted the script. After the participants were emitting eight or more scripts without any prompts for at least two consecutive sessions, script fading was initiated. Scripts were faded from the end to the beginning and started by deleting the last word of the script. This process continued until no script was being emitted by the recording device. Generalization was not assessed in this study.

A multiple baseline design across participants was used to assess the effects of the script and script fading procedure on teaching responses to the initiations made by the peers. Data was collected on scripted, unscripted and novel responses made to the initiations by the other participants. The definition of these measures was the same as the prior research conducted by the authors of the current study (Wichnick, Vener, Keating & Poulson, 2009).

The results indicated a systematic increase in responses to initiations made by peers following the intervention using scripts and script fading. Following script fading, the number of unscripted responses continued to increase, thereby demonstrating the effectiveness of this procedure in increasing the unscripted responses. Data on novel responses was graphed cumulatively and indicated a continuous increase in the number of novel responses made by the participants following the script fading procedure. One limitation of this study is a lack of incorporating and assessing for generalization of the intervention.

Taken together, studies by Wichnick, Vener, Pyrtek and Poulson (2010) and Wichnick, Vener, Keating and Poulson (2010) were effective in teaching conversational skills to three children with autism. They first taught the participants to initiate a conversation and then taught them to respond to these initiations. However, none of the studies incorporated participants' interests when selecting toys or activities used during the intervention. Additionally, only one of the two studies assessed generalization. Specifically, the study only assessed generalization with new stimuli, and therefore future studies should assess generalization across new individuals and new settings.

Howlett, Sidener, Progar and Sidener (2011) recently completed a study that used the script-fading procedure to teach requesting information for a missing item to children with language delays. Two, 3-year old boys were included in this study. Both the participants presented delays in expressive language and one of the two participants had an additional diagnosis of autism. Preschool Language Scale (PLS) was used to establish pre-intervention expressive language skills in both the participants. The results from PLS indicated that the two boys were comparable in their language skill. Further, none of the

two participants had learned to request for information, although, they could request for a wide variety of items.

Ten highly preferred toys were included in the study for each of the two participants. These items were selected after making classroom observations and following a parent interview. The items included in the study were only accessible during the study sessions. In order to manipulate the motivation of the participants, a toy was missing in some trials (called as high motivation condition) and present in the others (called as low motivation condition.) Five items were randomly assigned to the high motivation condition or toy absent condition, where the toys were hidden from the participants' view and the other five items were assigned to the low motivation condition or toy present condition.

Each session was 30-45 minutes in duration, and the sessions were conducted at least three times a week, at the participants' school. Each session consisted of five high motivation trials and five low motivation trials. The participants determined the order of the trials, by selecting the photographs of the toys placed on the selection board. Before starting the intervention, both the participants were able to label the photographs of all the toys included in the study, identify the picture of the target toy from a array of at least 10 other pictures, obtaining a corresponding container for the toy, following the command of going to at least 15 different locations within the school building and repeat audio-phrases heard from a digital voice recorder.

A multiple-probe design across participants was used to assess the effect of the intervention. Data was collected and presented as the "percentage of trials with the request "Where's [object]?" The data was collected on the high motivation trials-prompted with scripts and unprompted; and low motivation trials. During the low

motivation trial, the participant was presented with the choice board with the photographs of the ten highly preferred toys. The participant was asked to choose one picture at a time. After the participant had made a selection, he walked to the toy shelf and selected the corresponding toy container. The participant was allowed to play with the toy for 2-3 minutes.

During the high motivation trial, similar procedure was followed, except that the toy container did not contain the corresponding toy. During high motivation trials in the baseline, if the participant did not request for information about the missing toy within 5s of looking inside the container, the instructor presented a simple instruction, ended the trial and started with a new trial by presenting the selection board. During the intervention phase in the high motivation trials, the instructor played an audio taped script to teach the request, "Where is [object]?" if the participant did not request for the information following 5seconds. After the participant repeated the script and asked for the object, the instructor told the participant the location of the missing toy.

Once the participant was speaking the entire script, within 5s of looking inside of the container for two consecutive sessions, the script fading was initiated. The script was fading from last word to the beginning, by removing the last word of the script first. However, prior to starting the stepwise fading process, a probe session was conducted to see if the participant was in need for a gradual fading process. The probe session was similar to the baseline condition. If the participant requested for information in the probe session, the script fading process was not used.

Pre- and post-intervention generalization probes were conducted with a new teacher and toys and in five new settings. Additionally, generalization was also assessed with toys naturally arranged on the floor, instead of being on the toy shelf.

In order to assess maintenance, sessions were also conducted 3-4 weeks after the completion of the intervention. Further, the social validity of the intervention was assessed by a survey, which was given out to six special education teachers and speech pathologists. The survey asked them about their likelihood of using the intervention, either in part or as a whole, for their student with language delays or autism.

The results of this study indicated that following intervention; both the participants were able to ask for information about the missing toy in the low motivation condition. One of the two participants had difficulty in differentiating high motivation condition from the low motivation condition, as this participant requested for information about the target item when the toy was present in the toy container. Further, script fading was not required for only one of the two participants, as this participant was able to request for information in the absence of the script, during the probe session. Additionally, both the participants were able to generalize the behavior across various conditions. They also maintained the skill after 3-4 weeks following the intervention. Both the teachers and the speech pathologists, perceived the intervention as highly acceptable.

There were three significant limitations in this study that should be addressed in future research. The first limitation is the use of highly preferred items in the two conditions of the study- high and low motivation. Although, a missing toy can increase the motivation of the participant, it remains unclear, if the presence of the toy in the low motivation condition, can truly lead to a "low" motivation in the participant. This is

especially important to address, as one of the two participants could not differentiate between the two motivational conditions. Further, it would be helpful to include low-preferred items to see if motivation truly influences the participants' requesting for information. The second limitation of the study was the use of new teacher and new toy simultaneously in one session while assessing for generalization. It is difficult to identify the variable(s) affecting change in the participants' behavior, if more than one variable is changed at the same time. Hence, the future research should assessment generalization by changing one variable at a time. The final limitation of the study pertains to the nature of the participants included in the study. Although both the participants were delays in their use of expressive language, one of the participants had an additional diagnosis of autism, which affects an individual's language and communication skills. In order to better generalize the results of the study, further studies should use a more homogenized group of participants.

Limitation of the Existing Literature on Scripts and Script Fading

The use of scripts and script fading procedures has been shown to be an effective intervention to increase social interaction and conversational skills in children with autism. However, there are a few areas of limitation in the existing literature. First, the existing studies make limited use of participants' motivation or interests when identifying topics for conversation or scripts to be used during intervention. Only two out of eight studies used script and script fading procedure and incorporated toys based on participants' interest when developing the script for conversation. Second, the studies have been inconsistent in assessing generalization of the treatment program. Most of the studies (five out of seven) only assessed generalization with new stimuli and did not

assess generalization with new individuals or in new settings. Only two study assessed generalization with new individuals in a new setting and using new stimuli, and two of the eight studies did not include generalization in their design.

Significance of the Current Study

The current study builds on the earlier research in three specific ways. First, the current study will use a systematic preference assessment method to select the topics for scripts to be used during intervention. Only one study used preference assessment to identify preferred topics for the scripts (Reagon & Higbee, 2009) while all the other studies described above either did not specify the reason for selecting stimuli for the scripts (e.g., toys, edibles) or made a brief mention of the procedure involved in selecting the stimuli used in the study (Howlett, Sidener, Progar & Sidener, 2011). In this study, the authors used three preferred toys for their scripts and demonstrated an increase in participants' unscripted verbalizations. Second, the current study will compare the effects of preferences, i.e., high preferences compared to low preferences on the various dependent measures (for example, initiation, scripted and unscripted conversations). The above described studies by Reagon and Higbeee (2009) and Howlett, Sidener, Progar and Sidener (2011) only examined the effect of using highly preferred toys. However, an important question is "What would happen if the less preferred toys were also used during intervention?" This lack of understanding about children's conversational skills following a script and script-fading intervention using a less preferred item, situation or scenario, will be one of the contributions of the current study. Finally, the current study will comprehensively assess the generalization of the newly acquired skill with new stimuli, a new setting and a new individual. It should be noted that each of these variables

influences the behavior in a unique way, making it important to examine the behavior in three separate scenarios. The research studies described above have been inconsistent in addressing the generalization of the newly acquired skill as part of their methodology. The few studies that have looked at the generalization of the new skill have only examined the skill either in a new setting (two out of eight studies), with a new person (three out of eight studies) or a new stimuli (six out of eight).

The aim of the present study is to assess the effectiveness of manipulating motivational conditions in teaching conversational skills to children with autism using scripts and the technology of script fading. The following questions will be addressed:

a) Do scripts based on highly preferred items increase initiation in conversations in comparison to low-preferred items?
b) Do scripts based on highly preferred items increase scripted and unscripted conversational skills, including turn talking, responding to questions or asking questions, when compared to scripts based on low preferred items?
c) Is the overall acquisition faster for topics that are preferred by the participants versus topics that are not preferred?
d) Is the generalization of conversational skill better for topics that are preferred by the participants versus topics that are not preferred?

The above are specific questions being addressed in the present study. The following hypotheses are being tested:

Hypothesis 1: Using a non-concurrent multiple baseline design (see definition in Glossary, Appendix I), children with autism, when taught conversational scripts based on

their highly preferred items, will show an increase in initiation of conversations (e.g., by commenting or asking questions) when compared to scripts based on low preferred items.

Hypothesis 2: Using a non-concurrent multiple baseline design (see definition in Glossary, Appendix I), children with autism, when taught conversational scripts based on their highly preferred items, will show a higher rate of scripted conversation which includes turn taking, commenting and answering and asking questions when compared to scripts based on low preferred items.

Hypothesis 3: Using a non-concurrent multiple baseline design, children with autism, when taught conversational scripts based on their highly preferred items, will show higher rate of unscripted conversation which includes turn taking, commenting, answering and asking questions compared to scripts based on low preferred items.

Hypothesis 4: Using a non-concurrent multiple baseline design, children with autism, when taught conversational scripts based on their highly preferred items will show faster acquisition when compared to the scripts based on low preferred items.

Hypothesis 5: Using a non-concurrent multiple baseline design, children with autism, when taught conversational scripts based on their highly preferred items, will show greater instances of generalization with new stimuli, settings and individuals, compared to scripts based on low preferred items.

Chapter 3: Methods

Participants

Three children with the primary diagnosis of Autism Spectrum Disorder (ASD) according to DSM IV- TR (APA, 2000) criteria as diagnosed by a medical professional (e.g., a psychiatrist or pediatrician) or licensed psychologist participated in the study. All the children were between the ages of 10 and 11 years. All the participants were recruited from the community and the study took place in a center serving children and youth with developmental disabilities in Atlanta, Georgia. None of the children included in the study had received and/or were receiving any interventions that specifically targeted conversational skills.

To be eligible for this study, children were required to possess some pre-conversational skills. This included being able to communicate verbally by using at least a single word and/or phrases, being able to demonstrate strong verbal imitation skills, repertoire which included being able to spontaneously imitate four to five word phrases, and being able to respond to simple questions like “What is your name?” “What school do you go to?” or “What is your mother’s name?” by using at least a single word, phrases or a simple sentence. Additionally, participants seldom asked questions from others or initiated conversation with others except for requesting preferred items or activities. Children who were non-verbal, used language only to request items or exhibited high rates of problem behavior (e.g., aggression, disruption or self injury) were ineligible for this study.

The participants’ current abilities and selection process are described below.

Andrew (Participant 1): Andrew was a 10-year-old male. He was enrolled in a special education classroom and was also receiving speech therapy and behavior analytic services for language development.

Richard (Participant 2): Richard was a 10-year-old male. He was enrolled in a special education classroom and was receiving speech therapy in a private setting.

Jennifer (Participant 3): Jennifer was an 11-year-old female. She was currently enrolled in special education classroom at 5-grade. Jennifer was also receiving speech therapy in addition to behavior analytic services for language and skill development.

Andrew and Richard came from bi-lingual family backgrounds, although, the caregivers reported that at home they used English as the primary language for communication. Both the families were of African descent. The caregivers did not report any differences in the language and communication skills of the two participants across the two languages that might be spoken at home. Further, the researcher's brief interaction with the siblings of the two participants did not indicate any difficulty in the use of English language for communication and the caregivers of the two participants were also fluent in their use of English language.

Instruments and Participant Selection

Pre-intervention measures. The participants were assessed by using the *pre-conversational language behavior checklist*, *the parent report of child problem behavior*, and *the assessment of verbal imitation skills*.

Pre-conversational language behavior checklist. The Pre-Conversational Language Behavior Checklist is a series of eleven questions complied by the research that was completed by the parent and the teacher of the participant. The researcher developed the

checklist to meet the specific purpose of this study which was to identify the existing level of conversational skills in the potential participants. The researcher developed specific items in consultation with the professionals who are actively engaged in research and practice in the area of language development and communication in children with autism. The statistical information, i.e., reliability and validity, is not available for this checklist.

The items were designed to inquire about participants' existing skill level in the various components of a conversation e.g., asking questions, responding to questions, making comments, responding to comments, initiating conversation, turn-taking etc. The respondents (parents and teacher) were asked to rate the participants using a 5-point rating scale where a rating of 1 indicated that the target behavior is "*never*" present and a rating of 5 indicated that the behavior occurs "*very frequently"* which was defined as occurring everyday or several times a day (See Appendix A for a copy of the parent checklist and Appendix B for a copy of the teacher checklist.)

The qualified participants received a rating of 4 or more on item 1 inquiring about their language skills, i.e., being able to imitate words and short phrases. Additionally, the participants were also required to receive a rating of 3 or less on items 4, 6, 10 and 11 inquiring about the conversational skills, i.e., asking questions spontaneously, making comments related to the conversational topics, and initiating conversation with adults and peers. Further, the qualified participants received a rating of 3 or more on items 5, 7 and 9 that inquired about their skills when engaged in a conversation, i.e., difficulty with conversational turn taking, difficulty staying on topic of the conversation and difficulty maintaining a conversation. If the rating score of the parent and the teacher was

significantly different, the researcher sought clarification and made a judgment call on the eligibility of the participant. This process was also employed for the individual rating scores.

For Andrew, his mother and a teacher who serve as his therapist at the school completed the scale. These individuals identified that he "very frequently" imitated short phrases and sentences. When asked about responding to new questions with a single word, Andrew's mother indicated that he did that "rarely" while his teacher reported that he responded "frequently." Along similar lines, when asked about responding to new questions with a short phrase, Andrew's mother reported it as "rarely" and his teacher responded as "occasionally." Based on the responses from the parent and teacher, it was determined that Andrew possessed the required language skill to qualify for the study. In terms of specific conversational skills, his mother reported that Andrew "rarely" asked questions spontaneously, where as the teacher reported that he exhibited this behavior "frequently." Further clarification with the teacher determined that she was referring to questions that were seeking permission to engage in certain activities. Both the teacher and the parent identified that Andrew had difficulty with conversational turn-taking, making comments related to the conversational topic, staying on the topic of the conversation and "very frequently" exhibited difficulty in maintaining a conversation. Further, Andrew's parent reported that he "occasionally" changed the topic of the conversation to his interest, whereas his teacher noted that he "very frequently" changed the topic of conversation to his interest. These ratings were in line with the inclusion and exclusion criterion of the study.

For Richard, his father and classroom teacher completed the scale. Both these individuals identified that Richard "frequently" or "very frequently" imitated short words and phrases. When asked about responding to a new question with a single word, his father reported that he responded "frequently" and his teacher reported that he responded "very frequently." His teacher further added that these responses might not always be accurate to the question asked. When asked about responding to a new question with a short phrase, his father reported this behavior as occurring "occasionally" and his teacher reported it as "never." Both the teacher and the father reported that Richard had difficulty with conversational turn-taking, making comments related to the conversational topic, staying on the topic of the conversation and maintaining a conversation. His father reported that Richard "never" changed the topic of the conversation to his interest, which was similar to his teacher's rating of "rarely." Similarly both these individuals reported that Richard either never or rarely initiated conversation with an adult or a peer.

For Jennifer, both the teacher and the mother identified that she was "frequently" able to imitate short phrases and sentences. They also reported that she was "occasionally" able to provide a single word response to a new question. When reporting about her responses for a new question using a short phrase, her mother reported that she was able to do so "rarely," whereas her teacher reported that she was able to do so "occasionally." In terms of conversational skills, both her mother and teacher reported that she had difficulty in conversational turn-taking, making comments related to the conversational topic and maintaining a conversation in general. They also reported that she "rarely" (mother) or "occasionally" (teacher) asked questions spontaneously or initiated conversation with adults or peers.

Parent report of child problem behavior. The Parent Report of the Child Problem Behavior is a checklist made by the researcher. The checklist consisted of a series of 18 specific problem behaviors organized under three broad categories, i.e., aggression towards adults, self-injurious behaviors and disruption. The parents of all the participants completed this checklist. This measure was developed by the researcher to gauge the severity of problem behaviors, if any, exhibited by the participants. This information was critical for the completion of the recruitment process, as it was important that the participants not engage in any behavior that could potentially interfere with the study procedures. The statistical information about this measure is not available as it is not standardized and is an informal measure of the various problem behaviors.

The parents of the participants were asked to rate their child's problem behavior on a 5-point rating scale where a rating of 1 indicated that the behavior "*never"* occurred and a rating of 5 indicated that the behavior occurred *"very frequently,"* i.e., everyday or several times a day (See appendix D for a copy of the rating scale.)

The eligible participants for the study received a rating of lower than 4 on all the items under the three domains. If the parent provided a rating of "3" for any of the items, the researcher sought further clarification and made a judgment call on the eligibility of the participant.

For Andrew, the parent identified "never" for all items on the checklist except for two items- *screaming* and *banging things*. For these items, the parents reported the behavior occurred "rarely." Further clarification on these items was sought and it was noted that in terms of screaming, Andrew spoke in a slightly raised voice and did not scream as defined conventionally. Similarly, in terms of banging things, his parent reported that it

occurred when he was playing with toys or blocks and would place them on top of each it other with a little force. None of these behaviors were deemed severe enough to interfere with the study.

For Richard, the parent identified "never" for all the items on the checklist except for three items - *throwing things, breaking things and tearing things*. Richard's father provided a rating of 2 (rarely) for throwing and tearing things. On further clarification, he reported that Richard threw things while playing with toys like balls but never in context of a therapy or classroom setup. Similarly for "tearing things," he reported that Richard rarely engaged in this behavior and had not done so for several years. When asked about "breaking things," his father reported that this tended to happen when he was coloring and the crayons broke in the process. He further added that Richard did not engage in this behavior with other educational materials like pens, pencils etc. and this behavior was not a cause of concern.

For Jennifer, the parents identified "never" for all the items under the aggression (towards adults) and self-injurious behavior domains. For the domain enlisting various disruptive behaviors, the parents reported that Jennifer "never" kicked things and only "rarely" threw things, tore things, banged or damaged things. On inquiring about the context under which these behaviors were exhibited, the parents reported that in the past they occurred when she was playing with toys or with her other sibling. The parents further added that none of these behaviors have been a cause of concern with Jennifer's teacher in the past.

Assessment of verbal imitation skills. The Assessment of Verbal Imitation Skills is a two-part informal assessment of verbal imitation skill made by the researcher. The

researcher developed this assessment to meet the specific purpose of this study, which was to assess for existing level of verbal imitation in the participants. The researcher developed this checklist in consultation with active researchers in the field of language development in children with autism. It was important to complete a direct assessment of the imitation skills, as verbal imitation is a critical component in the present intervention. The statistical information for this assessment is not available, as this assessment is not standardized.

This two-part assessment was completed by the researcher on the participants. The first part of the assessment is a series of 10 everyday words and the second part is a series of common short phrases. The eligible participants for the study were required to imitate the presented words and sentences with 80% or greater accuracy. For example, if the participant was presented with five words, they should be able to imitate at least four words.

Correct imitation was defined as clear or near approximation of the presented stimuli and was followed by high social praise. Incorrect imitation was defined as partial or lack of responding within three to five seconds following the presentation of the stimuli, responding with an incorrect word or responding with a very poor approximation of the stimuli.

First, the imitation of words was assessed. This assessment consisted of a list of ten words and the words were randomly selected. To conduct this assessment, the participant was provided with an instruction to imitate the words emitted by the researcher. To begin, a practice session or trial was conducted as outlined in the assessment. Once the participant had successfully completed the practice session, the researcher started to

present the target words. The participant was given 3 to 5 seconds to imitate the presented word. A check mark (✓) was placed in the cell next to the word which indicated correct imitation and a cross mark (✗) indicated incorrect imitation. If the participant successfully imitated five consecutive words on the list, this assessment was discontinued and the assessment of verbal imitation for sentences was initiated. However, if the participant was unable to imitate the words, the researcher presented all the items on the list.

Following the assessment of imitation skills for words, the assessment of the imitation skills for sentences was conducted. This assessment consisted of ten sentences consisting of three to five words. The length of these sentences was similar to the length of the sentences later included in the scripts. Similar to the assessment with words, the participant was provided with an instruction to imitate the sentence emitted by the researcher. A practice session was conducted as outlined in the assessment. Once the participant had successfully completed the practice session, the target sentences were presented to the participant. The participant was given three to five seconds to imitate the presented sentence. A check mark (✓) was placed in the cell next to the sentence, which indicated correct imitation and a cross mark (✗) indicated incorrect imitation. The participant was presented with all the ten sentences (See appendix C for a copy of the scale.) All the three participants were able to imitate the first five words of the assessment and at least nine out of ten phrases.

Once the assessments described above were complete, the participants were recruited for the study and they continued with pre-study procedures of the study, as described in the following sections.

Reinforcer Assessment of Individuals with Severe Disabilities (RAISD). The RAISD (Fisher, et al., 1996) is a series of 10 questions that ARE was given to the parents/caregiver of the participant to identify preferences. This instrument is an indirect method of preference assessment and was used to identify potential reinforcers. The parents first completed the ten questions and identified various items and activities that were highly preferred by the participant. Following this, the parents were asked to rank the items. The items were ranked from one to 16 where a stimulus ranked one was most preferred and a stimulus ranked 16 was the least preferred.

Several studies have used this measure to identify preferences in individuals with various developmental disabilities. Some of these studies are Zarcone, Crosland, Fisher, Worsdell and Herman (1999); Bowman, Piazza, Fisher, Hagopian and Kogan (1997) and Cote, Thompson, Hanley and McKerchar (2007). There is no statistical information available for this measure.

For this research, the parent completing this assessment was also asked to identify various non-preferred items under each domain. After these items were identified, they were asked to rank these items from highly non-preferred being ranked as one. At the end of this assessment, a list of eight items was generated which included four items that were highly preferred and four that were not preferred by their child. These items were included in the paired-choice preference assessment, which is a direct method of preference assessment. If the caregivers were unable to provide a list of eight items, the lead researcher enlisted additional items (in consultation with the caregivers) to be included in the preference assessment.

Table 3 lists the items indentified by the parents. These items were included in the paired choice preference assessment. (See Appendix E for a copy of the interview.)

Paired choice preference assessment. A paired-choice preference assessment for items (Fisher et al., 1992) was conducted using the information from the RAISD. The objective of the paired-choice preference assessment was to identify a hierarchy of preference from highly preferred to least preferred for various items (e.g., SpongeBob video, playing with cars etc.) Eight items (four preferred and four non-preferred) were included in the preference assessment.

For the assessment, each item was paired with every other item and presented in a random order such that a total of 28-paired trials were completed. During this assessment, participants had the opportunity to choose each item seven times. Prior to starting this assessment, the participants were given a 5-10 second exposure to each item included in the assessment. The participants were exposed to each item one at a time. When handing over the item, the researcher verbally labeled the item saying something like, "Here is a Dora movie." At the end of this interval, the researcher restricted access to the item and provided access to the next item on the list. This process continued until the participant had made contact with each item. Next, the participant was presented with two items and was asked to "Pick one." For example, the researcher would hold two items and say, "Here is a Dora movie and Buzz Light Year, pick one." The participant had five seconds to make a selection, which was indicated by approaching the item, pointing to it or asking for it. Following a selection, the participant was given five seconds to engage with the selected item. At the end of five seconds the item was retrieved from the participant, the new trial begun and the participant was presented with the next pair. If the participant did

not make a choice within five seconds, the pair was presented again using the process described above. If the participant failed to make a choice following the second presentation, this was noted and the participant was presented with the next pair on the list. Each pair was presented no more than two times.

Data was collected on the selections made by the participants. At the end, the total number of selections for each item during various presentations was calculated. This frequency data was then converted into percentages thereby generating percent selection for each item. Items with higher percentages of selection indicate higher preference and the items with lower percentages of selection indicate lower preference for the participant. The top two items/activities were selected for the high motivation script condition and the bottom two leisure items/activities were selected for the low motivation script conditions.

The results of the preference assessment were graphed and organized in a descending order of preference such that the items on the left are highly preferred and the items on the right are least preferred. Along the x-axis are the various items included in the assessment and along the y-axis is the percentage of selection for each item. The top two preferred items and the bottom two non-preferred items were selected and included in the study for all the participants. These items were identified in the grey bars on the graph. The figures 3(a), 3(b), and 3(c) illustrates the results of the preference assessments for Andrew, Richard and Jennifer respectively.

For Richard, the highly preferred items were the “Mickey Mouse movie” and playing with Rice “Grains.” His least preferred items were listening to “Baby songs” and “Writing” words.

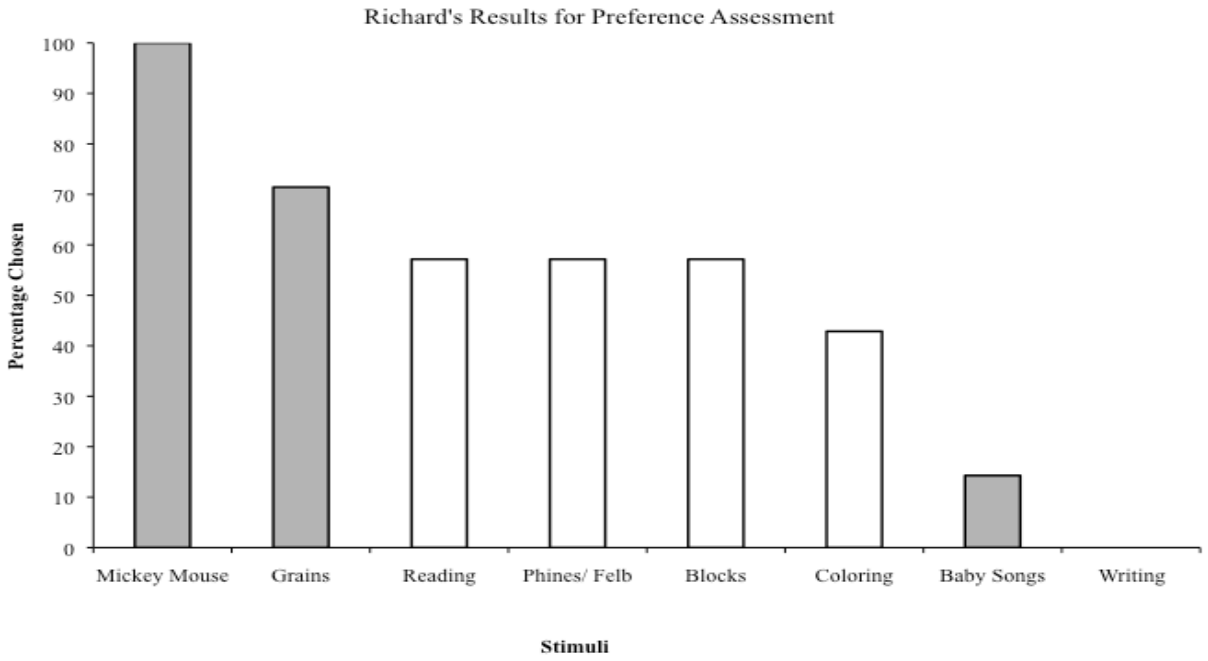


Figure 3(b). Richard's preference assessment results.

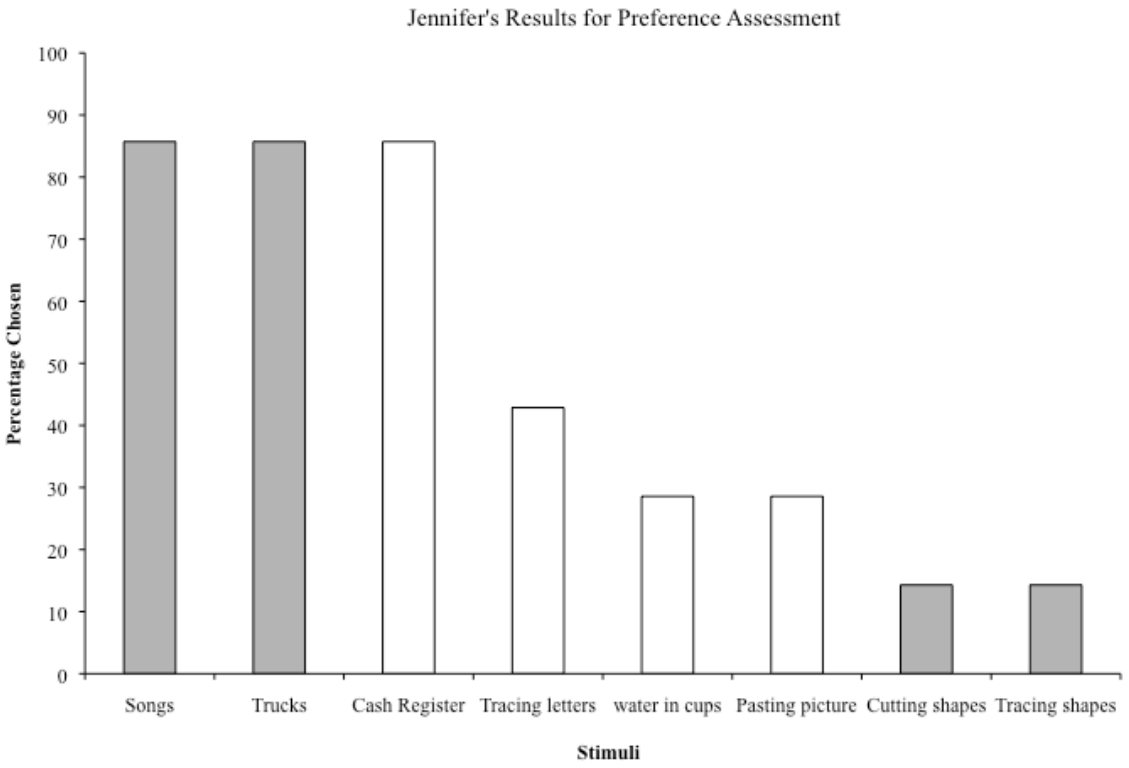


Figure 3 (c). Jennifer's preference assessment results.

For Jennifer, the highly preferred items were "Miscellaneous songs" and "Trucks." Her least preferred items were "Cutting shapes" and "Tracing shapes."

For Andrew, the preferred assessment identified cutting "PBS kids logo" and "Cutting shapes" as highly preferred activities. Additionally, "Reading" *The Five little monkey* book and playing on "Kid-Pix computer games" were least preferred. It should be noted that for Andrew, cutting "PBS kids logo activity" was replaced with the next highly preferred activity "Copying words/sentences," as he exhibited distress in the form of crying during the baseline session when the "PBS Kids logo" was retrieved from him following a one-minute access. During this session, Andrew continued to make requests for the "PBS Kids logo" both verbally (e.g., "I want it…its mine," "Give it to me," etc.) and physically by pulling on the researcher's hands and climbing on the chair to reach the

logo. At the end of the session, Andrew began crying and had to be calmed down for several minutes before he left for home. A decision was made to include "Copying words/sentences" and "Cutting shapes" as Andrew's highly preferred items, and "Reading" and playing on "Kid-Pix computer game" were identified as the least preferred items.

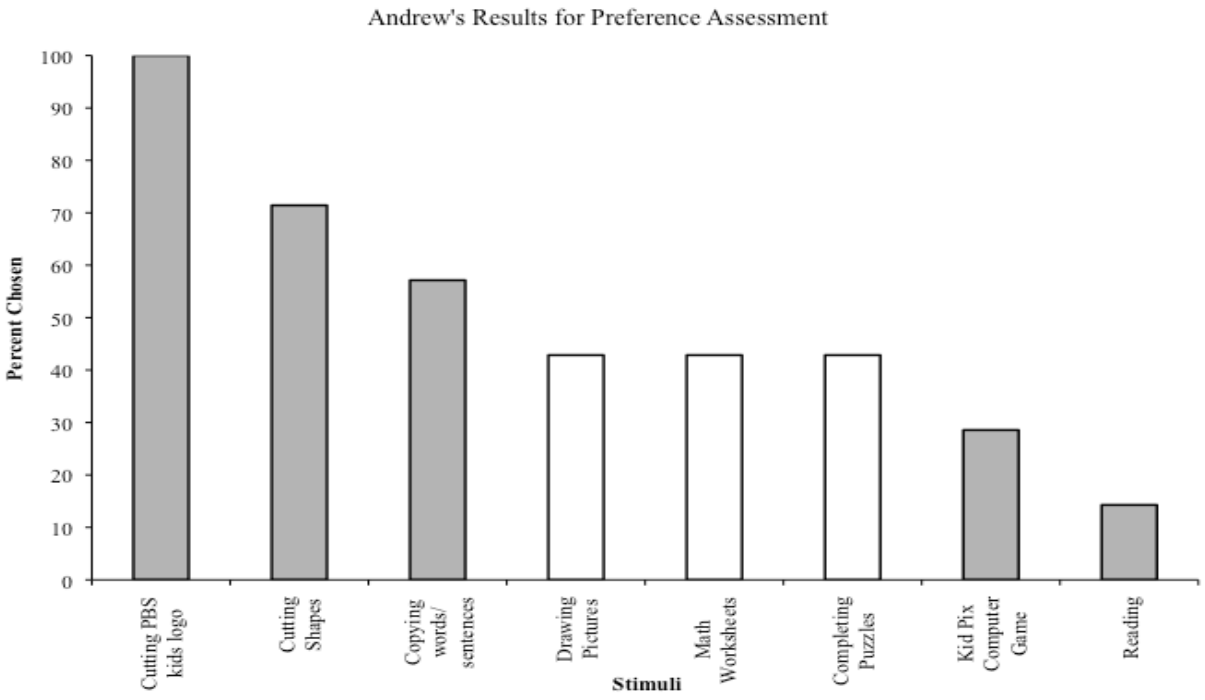


Figure 3 (a). Andrew's preference assessment results.

Procedures

Setting and Materials. All the sessions were conducted in a session room with a one-way observation mirror (layout of the room is shown in Figure 1.) During baseline and treatment sessions, the room had one table and two chairs arranged such that the participant and the researcher were seated across the table from each other. Additionally,

script related materials and data sheets were present in the room for all the sessions. A hand held video camera mounted on a tripod was used to record all the sessions.

During treatment sessions, additional materials related to the script were present in the room. These included an electronic card reader (Califone ® card reader) and a ring binder containing magnetic cards with recorded scripts. The Califone® card reader and associated magnetic cards with the capacity to record audio input was used for teaching the scripts.

An electronic card reader was used in this project for several reasons. First, the use of such an electronic device makes it easier to transport the script to diverse environmental settings like a playroom, stores etc. Second, the use of an electronic device also makes the intervention less labor intensive by requiring fewer individuals to implement the intervention, which makes the intervention useful and applicable in settings with limited resources. Third, using an electronic device to emit the script does not require the participants to possess reading skills, thereby making it easier to include participants with limited or no reading skills. Finally, review of literature and the past research with scripts and script fading has employed an electronic device to relay the scripts.

Pre-Study Procedures. Following the identification of the preferred and non-preferred items, a script was developed on each of these items, such that each participant had individualized scripts. These scriptes were recorded on the magnetic cards. One magnetic card consisted of one response and each response consisted of two audio scripts. The first part of the script was a response to the conversational partner's question and the second part of the script was a question posed to the conversational partner. These scripts were played using the card reader.

Each script consisted of seven sentences, three spoken by the child and four spoken by the researcher who was the conversational partner for the participant. Each script started and ended with the researcher's sentence. The sentences started with a response or a comment and ended with a question, which lead to the next sentence. An exception was the last sentence in the script. For each topic, the participant was required to complete three responses or six scripts to complete a scripted conversation.

These scripts were used during the various study phases. Tables 4(a), 4(b) and 4(c) lists the various scripts used for Andrew, Richard and Jennifer, respectively.

Pre-treatment teaching. Prior to starting the intervention, all the participants were trained to use the Califone® card reader and to imitate recorded responses on the magnetic cards. The scripts were played on the electronic script reader called Califone® card reader. Additionally, a participant, the researcher and a prompter were present in the room during the teaching procedure. The researcher served as the conversational partner and the role of the prompter was to provide prompts during the teaching. The researcher sat across the table, facing the participant at all times. The prompter was present beside or behind the participant and was never in between the researcher and the participant.

Each training session consisted of ten trials in which different one-word phrases were used for training (See Table 1 for a list of behaviors involved in a trial.) At the start of the training, a ring binder was placed on the table alongside the card reader. The ring binder consisted of A4 sheets with one magnetic card attached to it. The magnetic card consisted of a pre-recorded training script. A one-word script was recorded on each card. During this training, all the participants were trained to pick up the card from the A4 sheet, slide

the card through the card reader, repeat the script emitted from the card reader, place the card back on the sheet and turn the page.

To begin the training session, the prompter began by providing a model prompt. During the model prompt, the prompter picked up the card from the sheet, slid the card through the card reader, immediately repeated the emitted script, placed the card back on the A4 sheet and turned the page. Following this prompt, the prompter provided a verbal cue "Now its your turn." If the participant correctly completed the entire behavior chain, the prompter prompted the participant to continue with the next card.

If the participant did not complete the entire behavior chain following the first model prompt, the prompter provided a physical prompt. The physical prompt included hand-over-hand guidance of picking up the card from the sheet, sliding the card through the card reader, immediately repeating the emitted script (participant repeats the script), placing the card back on the A4 sheet and turning the page. After the participant repeated the script, the prompter physically prompted the participant to replace the card on the sheet and turn the page. Following this prompt, the prompter provided a verbal cue "Now it's your turn." If the participant correctly completed the entire behavior chain, the prompter discontinued the physical prompt. However, if the participant engaged in an error while completing this behavior chain, the prompter immediately provided a physical prompt. After providing two physical prompts, the prompter discontinued the use of physical prompts and used a model prompt in the next trial. If the participant continued to make errors, the prompter provided a physical prompt. The above-mentioned rules were used when moving from the physical prompt to the model prompt and vice-versa.

If the participant did not repeat the script heard from the card reader, the prompter continued to prompt the participant to slide the card through the card reader ten times or until the participant repeated the script, whichever came first. If the participant did not repeat the script at the end of the tenth swipe, the prompter provided a model prompt by demonstrating all the steps involved in the behavior chain. At the end of the prompt, the prompter asked the participant to continue with the next card by saying something like "Keep going." Additionally, high social reinforcement like verbal praises, hugs etc. were delivered if the participant completed the behavior chain either independently or following a model prompt (Lee, 2006).

This training process continued until the participant reached the mastery criterion of correctly responding for 90% of the trials across two consecutive sessions (Lee, 2006). Correct responding was defined as completing all the steps of the behavior chain without a model or physical prompt. If the participant did not reach the mastery criterion following 10 training sessions, appropriate modifications to the delivery of social reinforcement were made such that the reinforcements were delivered after any or all of the steps in the behavior chain in order to increase the target behavior.

In addition, Jennifer was trained on the card reader on two separate occasions. Although she met criteria, she was not successful during intervention and training was done again. The first training for Jennifer was completed by using a list of single words and the second training was completed by using a list of short phrases. This was done in order to facilitate her use of the card reader and her repetition of the phrases. These phrases were not used in the scripts during the treatment phase.

Experimental Design

The objective of the study was to identify the effect of motivation on the acquisition of conversation skills in children with ASD using scripts and script fading procedures. A non-concurrent multiple baseline design across participants and a multiple schedule design (Barlow & Haynes, 1979; Kazdin, 1982) was used to assess the effect of this intervention. The intervention strategy included scripts, a script-fading procedure and reinforcement for engaging in conversation (Brown, et al., 2008; Krantz & McClannahan, 1993, 1998; Stevenson et al., 2000).

A non-concurrent multiple baseline design across participants was an appropriate method for evaluating the effect of the intervention, since this intervention by nature cannot be reversed or withdrawn. Use of this design allowed systematic demonstration of the effect of treatment for each participant (Rapoff & Stark, 2007). The non-concurrent design, unlike the more traditional concurrent design, involves the observation of different individuals at different times. In this design, data are not collected simultaneously, and it allows the participants to be evaluated at different points in time.

Following a non-concurrent multiple baseline design, the length of the baseline phase for each participant was varied. For the first participant, Andrew, four baseline sessions were completed for each stimulus for a total of 16 sessions. For the second participant, Richard, five baseline sessions were completed for each stimulus and a total of 20 baseline sessions were completed. For the third participant Jennifer, six baseline sessions were completed for each stimulus and in total 24 baseline sessions were completed.

A multiple schedule design was used in order to evaluate the effect of multiple treatments or stimulus conditions on the target behavior (Kazdin, 1982). In a multiple

schedule design, two or more treatment/stimulus conditions are alternated in quick succession. This is done in order to identify and understand the effects of each treatment/stimulus condition on the target behavior. The different stimuli conditions were varied or distributed such that the influence of these conditions can be associated with distinct treatment/stimulus effects on the target behavior (Kazdin, 1982).

In the present research, the data was collected under two conditions: (1) Preferred or high motivation scripts and (2) non-preferred or low motivation scripts. Data collection for the two conditions was the same and followed the same experimental design.

To begin, baseline data was collected on the target behaviors for all the four scripts for each participant prior to starting the intervention. Following the multiple baseline design, once the target behaviors were stable during the baseline phase, i.e., either showing no change or the target behavior was on a decreasing trend (Kazdin, 1982) across three consecutive sessions, the treatment was applied to two scripts at a time - one script each in the high motivation and low motivation condition. In the treatment phase, there were four stimulus conditions: treatment script 1 high preferred (Δ MO+), control script 2 high preferred (▲ MO+), treatment script 1 low preferred (O MO) and control script 2 low preferred (● MO-). The symbols in the parentheses provide a description for the condition and also help in representing them graphically. High-preferred conditions are represented with triangles and low preferred conditions were depicted with circles. In addition to this, empty symbols represented the scripts included in treatment and solid symbols represented scripts that served as probes. Finally, the symbols "+" and "-" represented highly preferred and low preferred conditions, respectively.

Each session was videotaped and frequency data was collected on scripted and unscripted conversations. The data sheet also included a checklist listing various steps involved in using the card reader (See appendix F for a copy of this data sheet.) Frequency data was graphed and was used to make phase change and script fading decisions.

A continuous event-recording system was used for data collection (i.e., data was recorded for each instance of the scripted and unscripted conversations during the whole session.) Trained data collectors recorded data in vivo or by watching the recorded video of the session. The lead researcher made decisions based on the data collected during each session before continuing with the study. In addition to the frequency data, verbal interactions or statements emitted by the participants in the session were also recorded verbatim (See appendix G for a copy of the data sheet.)

Dependent variables. Scripted conversation and unscripted conversation were the two dependent variables in this study. Frequency data was collected for these dependent variables.

Scripted conversation. Scripted conversation was scored when the participant's verbal production was identical to the script being used in the session either in part or in whole. If the verbal production differed only in conjunctions, articles, prepositions, pronouns, tenses or plurals it was scored as scripted conversation. Additionally, if the participant altered the order of the words in the script or emitted part of the script used in another session, the verbal production was scored as scripted conversation (Brown et al., 2008; Krantz & McClannahan, 1993, 1998; Stevenson, et al., 2000). Following script

fading, the faded script and any additional words was scored as scripted if it met the above criteria (Brown et al., 2008).

Unscripted conversation. Unscripted conversation was scored when the participant's verbal production differed from the script by more than conjunctions, articles, prepositions, pronouns, tenses, plurals or the order of the words. For example, if the participant said, "I want M& M" when the script read, "I want candy" the verbal production was scored as unscripted. Additionally, changes in adjectives were also scored as unscripted. For example, "I want red candy" was scored as unscripted if the script read, "I want green candy" (Brown et al., 2008; Krantz & McClannahan, 1993, 1998; Stevenson, et al., 2000). Unscripted conversation during the session was scored under two distinct sub-categories: unscripted related and unscripted unrelated.

Unscripted Related. Unscripted related was scored when the participant's verbal production was unscripted but related to the topic of the script currently being used in the session. For example, if the topic of the script was a movie, then an unscripted related verbal production was "Turn on movie" if the script said, "Play the movie."

Unscripted Unrelated. Unscripted unrelated was scored when the participant's verbal production was both unscripted and unrelated to the topic script currently being used in the session. For example, if the topic of the script was a movie, then an unscripted unrelated verbal production was, "I want candy" if the script said, "Play the movie."

Experimental Conditions

Baseline. In the baseline session, materials as described in the previous section were present. Prior to starting the baseline condition, the participant was given one-minute access to the script related materials. For example, if the script was based on "bubbles,"

the participant was allowed to play with bubbles for one minute. These items provided an opportunity and a context for the child and conversational partner to engage in a conversation. During this time, the researcher and the prompter did not talk. At the end of one minute, the conversational partner restricted access to the items by retrieving them from the participant. If the item was activated, for example if the bubble-making toy was turned on, the conversational partner turned it off. The conversational partner then spoke the first sentence of the script, for example, "We have some toys. What are these?" signaling the start of a ten-minute interval. The conversational partner did not provide any additional verbal or physical prompt following this statement and ignored any verbal (for example, "I want movie") or gestural requests (for example, pointing) to gain access to the item. The conversational partner was available to respond to any questions or statements made by the participant that was directed towards the conversational partner. The response of the conversational partner ended with a question. The session continued until ten minutes had elapsed or until the participants had emitted three responses that were item related.

If at the end of ten minutes the participant had not spoken three item-related responses, the participant was not given access to the item. However, if the participant had spoken three responses that were related to the item, he or she was allowed access to the item for one to two minutes. Data was collected on all the words and phrases spoken by the participant. It is important to note that the responses had to be made within 15 seconds of each other in order qualify as a conversational exchange.

Treatment. The treatment sessions were set up just like the sessions in the baseline conditions. In addition to this, intervention material including the Califone® card reader

and magnetic cards on an A4 sheets were placed in the room. The participant was given one-minute of pre-session exposure to the items. At the end of one minute, items were removed and the participant was seated in the chair along with the card reader, magnetic script cards and the script-related items on the table. The session started with conversational partner initiating the scripted conversation by emitting the first sentence on the script. At the end of the first sentence emitted by the conversational partner, the participant took his/her turn by using the magnetic card. Each sentence in the script consisted of four to five words. The participant and conversational partner continued to take turns until the end of the script.

The prompter implemented the prompting procedure similar to the one employed during the card reader training. However, if the participant failed to imitate the sentence after swiping the card within five seconds, the prompter continued to provide manual guidance to swipe the card again. This behavioral rehearsal (McClannahan & Krantz, 2005) of swiping the card continued until the participant repeated the audio script. No verbal instructions were provided to the participant. The conversational partner continued with the conversation by emitting his or her part in the script. This back and forth scripted conversation continued until the end of the script or until 10-minutes had elapsed. At the end of the session or script, the participant was allowed one to two minutes of access to the item.

Each participant completed at least four 10-minute sessions each day. During the break between the sessions, the participant was taken away from the session room, and the prompter was present with the participant. The participant did not have access to the script-related materials outside of the session. If during the treatment session it was noted

that the participant was not repeating the scripts emitted by the script reader, the prompter continued the behavior repetition of hand over hand prompting to guide the participant to slide the card through the card reader. This process continued for at least two treatment sessions before making a decision on re-training the participant on the card reader or making appropriate modifications to the prompting procedure.

Script fading. The script fading procedure described by Stevenson, Krantz & McClannahan (2000) and Krantz & McClannahan (1993, 1998) was used in the present research. The scripts were faded from the end to the beginning by deleting the last word from the phrase first such that the deleted word was not heard when the participant swiped the card through the card reader. The participant was expected to complete the sentence by either using a previous scripted response or a novel unscripted response. At the end of the fading process, a blank/empty card reader was placed on the A4 sheet. The empty card and the ring binder were also faded. The empty card was faded first in two steps. The first step included cutting the card in half and the second step included completely removing the card and only presenting the ring binder. After the empty card had been successfully faded, the ring binder was also faded in two steps. The first step included removing the front of the binder, and the second step included removing the complete binder (See Table 2 for the various steps of script fading.) For the sessions with script fading, the participants' responses were scored using various response measures described above.

Decision for script fading. The script fading procedure began after the participant had independently completed the five discrete steps (picking up the magnetic script card, swiping it in the card reader, emitting the script heard via card reader, placing the card

back on the sheet and turn the page) with 100% accuracy across three consecutive sessions. If the participant continued to make errors at any of the above steps, script fading was not initiated. The script fading process was initiated for each sentence in the script independently.

Following the fading process, if the participant failed to imitate and complete the sentence by either providing a scripted or novel response within five seconds after the audio script had been emitted, the prompter followed the previously described behavioral rehearsal (McClannahan & Krantz, 2005) by manually prompting the participant to swipe the card through the card reader. If the participant continually failed to complete all three scripts, leading to three instances of manual prompting within a session, then this session was ended. In the next treatment session, the faded script was replaced with the script from the previous step in the script fading process. The decision to re-initiate script fading was made based on the decision rules described above. This process continued until the whole script had been faded and the participant was independently emitting the scripted phrase or a novel response.

Generalization. Generalization of the dependent measure was assessed using novel stimuli, novel adult individuals and novel settings.

Generalization: Novel stimuli. When assessing generalization across novel stimuli, one preferred and one non-preferred items from the preferences assessment was used. The generalization sessions across novel stimuli were conducted throughout the study and were completed with a ratio of 3:1, i.e., one generalization session for every three treatment sessions. Generalization sessions were same as baseline sessions. The sessions were completed with the same conversational partner present during baseline and

treatment sessions. Additionally, these sessions were conducted in the session room with the same room settings where the baseline and treatment sessions were conducted.

Generalization: Novel setting. The generalization in a novel setting was conducted after the treatment and script fading sessions were completed. Treatment items were used for assessing generalization. The novel setting was the hallway in the clinic. No prompt or script was available for the participant. However, a script was provided to the conversational partner. The session was similar to a baseline session. The participant was given a one-minute pre-session exposure to the item following which the access to the item was restricted. The conversational partner spoke the first sentence in the script, which marked the beginning of the generalization session. The sessions were ten minutes in duration and similar to the baseline session. Three generalization sessions were completed for each of the treatment scripts. Data was collected on all the response measures.

Generalization: Novel individual. Generalization across novel individuals was conducted after the treatment and script fading sessions were completed. These generalization sessions were conducted in the session room with a bachelor's level therapist with no prior interaction with the participants. The therapist was given the script but no prompt or script was available to the participants. The sessions were ten minutes long and similar to a baseline session. The participants were given a one-minute pre-session exposure to the item following which the access to the item was restricted. The adult spoke the first sentence in the script, which marked the beginning of the generalization session.

Data Analysis

The intervention data are graphically represented. The session numbers are on the X-axis, and the frequency of various dependent measures was represented on the Y-axis. Data was graphed for each participant separately.

In order to assess the effectiveness of the intervention for each participant, Percentage of Non-overlapping Data (PND) between baseline and treatment phase was calculated (Scruggs & Mastropieri, 1998). It is suggested that overlap between data in the baseline and treatment conditions is significant in ascertaining the outcome or effectiveness of the procedure (Scruggs & Mastropieri, 1998). According to Kazdin (1978, p. 637), "If the performance during an intervention phase does not overlap with performance during the baseline phase when these data points are plotted over time the effects usually are regarded as reliable. The replication of non-overlapping distributions during differential treatment phases strongly argues for the effects of treatment." Although no overlap might be considered as the best-case scenario, the rule of thumb that should be followed is that the "lower the percentage of overlap, the greater the impact of the intervention on the target behavior" (Tawney & Gast, 1984, p.164).

Hence, PND was calculated for each participant to ascertain individual effectiveness of the intervention. In order to calculate PND, the method described by Scruggs et al., (1987a) and Scruggs (1992) was used. In this method, first, a line parallel to the X-axis is drawn through the highest point in the baseline condition. The line is drawn in the direction of the various treatment phases. Second, the proportion of data points lying above this line and total number of data points are calculated. For example, if the total number of data points in the treatment phase is ten and there are nine data points above

the line, then the proportion is 9/10 or 90% (Scruggs & Mastropieri, 1998). This is percentage is the PND. For the current research, PND scores between 70 and 90 were considered effective, scores between 50 and 70 were considered questionable and the scores below 50 were regarded as ineffective (Scruggs & Mastropieri, 1998).

Inter-Observer Agreement (IOA). Data on all sessions was recorded in vivo either by the conversational partner or by a trained data collector. The data collector was a bachelor's level therapist. Two independent trained data collectors scored at least 33% of the baseline and treatment sessions for each participant in order to calculate inter-observer agreement or reliability. In addition to this, at least 33% of the treatment sessions each were scored for fidelity of the implementation of the treatment sessions. Further, at least 33% reliability on session fidelity data was obtained for both the treatment conditions.

The lead researcher provided training on scoring the scripted and unscripted conversations. The lead researcher was the primary data collector and all others established reliability through comparison with the lead researcher's scoring. Data collectors were deemed reliable with the primary data collector when reliability was at or above 80% for three consecutive sessions. This was calculated by dividing the number of agreements by the total number of trials (items).

A trial-by-trial IOA method was used to calculate reliability. This method is used when there are discrete and distinct opportunities for the behavior to occur, thereby giving an opportunity to score the behavior as occurred or not occurred, present or absent, etc. Similarly, for each of the several behaviors, the data collected can indicate if the behavior was observed or not observed, occurred or not occurred etc. To assess

reliability, number of trials or items agreement is divided by the total number of trials or items and then multiplied by 100. This gives a trial-by-trial IOA %.

$$\frac{\text{Number of Trials (items) Agreement}}{\text{Total Number of Trials (items)}} * 100 = \text{Trial-by-Trial IOA \%}$$

Inter-observer agreement was calculated for at least 33% of the baseline sessions (range= 33.33% - 45%). The average IOA for the baseline sessions was 86% (range= 75%- 100%). Inter-observer agreement was also calculated for at least 33% of the treatment sessions (range= 39.34% - 45.70%). The average IOA for scripted conversation was 96.06 % (range= 91.66% - 98.82 %) and the average IOA for unscripted conversation was 94.47% (range 91.66% - 97.7 %).

Inter-observer agreement on the treatment fidelity was also collected for at least 33 % of the sessions (range= 36.06 % - 42.05 %). The average IOA for treatment fidelity was 100%. Reliability data on the treatment fidelity was also calculated for at least 33% of the treatment fidelity sessions (range= 34% - 100%) and the average IOA data was 95.46% (range= 94.28% - 96.66%).

Evaluating hypothesis # 1. The first hypothesis stated that children with autism when taught conversational scripts based on their highly preferred items would show an increase in initiation of conversations (e.g., by commenting or asking questions) when compared to scripts based on low preferred items.

This hypothesis was assessed by examining the difference in the scripted and unscripted conversation during the highly preferred and least preferred conditions. In order to support this hypothesis, the participants should demonstrate greater initiations in the conversation for the sessions using highly preferred items, which was assessed by the visual inspection of the graphs.

Evaluating hypothesis # 2. The second hypothesis stated that children with autism, when taught conversational scripts based on their highly preferred items, will show a higher frequency of scripted conversation which includes turn-taking and commenting, and answering and asking questions when compared to scripts based on low preferred items.

This hypothesis was assessed by examining the number of scripted conversation for sessions with highly preferred and low preferred item. These outcomes were then compared. This hypothesis would be supported if the frequency of scripted conversation was greater for the conditions using highly preferred items.

Evaluating hypothesis # 3. The third hypothesis stated that children with autism when taught conversational scripts based on their highly preferred items, will show higher frequency of unscripted conversation which includes turn-taking and commenting, answering and asking questions compared to scripts based on low preferred items.

Like hypothesis # 2, this hypothesis was assessed by examining the number of unscripted conversation for sessions with highly preferred and low preferred item. This hypothesis would be supported if the frequency of unscripted conversation was greater for the conditions using highly preferred items.

Evaluating hypothesis # 4. The fourth hypothesis stated that children with autism, when taught conversational scripts based on their highly preferred items, showed faster acquisition when compared to the scripts based on low preferred items. This hypothesis was assessed by examining the number of sessions spent on acquiring scripted conversation based on highly preferred and low preferred items. This hypothesis would be supported if the number of sessions required to acquire scripted conversation based on

highly preferred items were lower than the number of sessions required for low preferred items.

Evaluating hypothesis # 5. The fifth and the final hypothesis stated that children with autism when taught conversational scripts based on their highly preferred items, showed greater instances of generalization with a new stimuli, a new settings and a new individual compared to scripts based on low preferred items.

This hypothesis was assessed by examining the participants' responses during the generalization phase of the study. For the generalization across a new stimulus, average responses emitted by the participants were calculated for the condition using highly preferred and low preferred item. This hypothesis would be supported if the average responses for high-preferred condition were greater than the average for the low preferred condition.

For the generalization across a new settings and a new individual, the procedure described above was used. This hypothesis was supported when the responses of the participants during the high-preferred condition were greater than the responses during the low-preferred condition.

Description of the Graphs. The results of the phases of the study were represented in a set of three graphs: treatment or intervention graphs (figures 4a, b, and c); probe graphs (figures 5a, b, and c) and generalization graphs (figures 6a and b), described in the following sections. These results will be discussed in the results section.

Treatment or intervention graphs. For the treatment graphs, the "sessions" were represented on the X-axis and the "number of responses" were represented on the Y-axis. A secondary Y-axis was included on the right hand side of the graph to record the

"percent correct in using the card reader" response of the participant. This axis ranges from 0 to 100 percent. A score of "0" indicated that the participant was not able to use to any of the 3 cards independently, a score of 33.3% indicated that the participant was able to use 1 of the 3 cards independently and a score of 100% indicated that the participant was able to use all the 3 cards independently.

Further, the treatment graphs are divided into two phases: the baseline and the treatment phase. These phases were divided by a vertical dotted line. The treatment phase included the script fading intervention. Further, each step in the fading process was marked with an arrow and a number representing the step number in the fading process.

One data path was recorded in the baseline phase and three data paths were recorded in the treatment phase. In the baseline phase, this data path was "unscripted conversation," indicated with a solid line. In the treatment phase, two additional data paths were represented. These were "scripted conversation" and "percent correct." "Scripted conversation" was indicated by a dotted line and "percent correct" was indicated by a solid line with star-shaped (*) marker. Each participant had a set of two treatment graphs, one for the high motivation condition and another one for the low motivation condition. The conditions were represented on the graph with the symbols described in the sections above, i.e., MO+ representing the high motivation condition and MO- representing the low motivation condition. In addition to representing the motivation condition, the specific stimulus was also specified on the bottom right hand side of the graph.

Figures 4(a), (b) and (c) indicated the responses of Andrew, Richard and Jennifer in the treatment conditions, respectively. The following is a sample treatment graph representing various components, without the data:

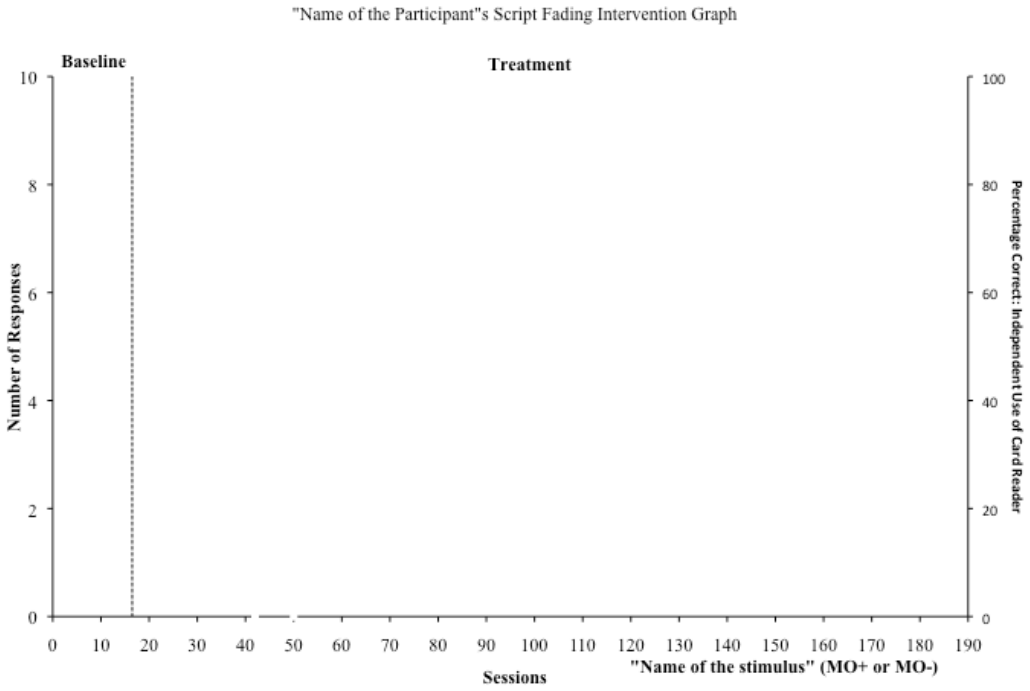


Figure 8(a): Sample treatment graph.

Probe graphs. For the probe graphs, the "sessions" were represented on the X-axis and the "number of responses" were represented on the Y-axis. The graph showed one continuous data path for "unscripted conversation". This was represented with a solid line. The conditions were represented on the graph with the symbols described in the sections above, i.e., MO+ representing the high motivation condition and MO- representing the low motivation condition. In addition to representing the motivation condition, the specific stimulus was also specified on the bottom right hand side of the graph.

Figures 5(a), (b) and (c), indicated the various responses of Andrew, Richard and Jennifer in the probe conditions, respectively. The following is a sample probe graph representing various components, without the data:

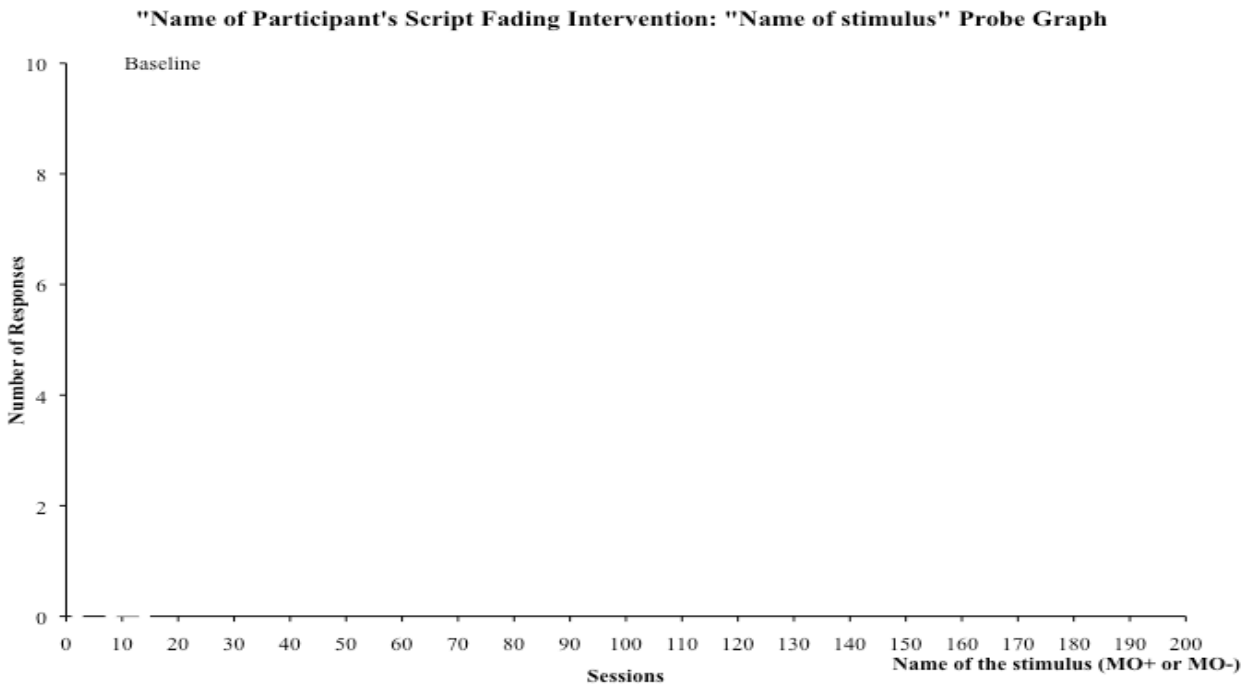


Figure 8(b): Sample Probe Graph.

Generalization graphs. For the generalization graph, the "sessions" were represented on the X-axis and the "number of responses" were represented on the Y-axis. The generalization graphs represented data on the stimuli undergoing treatment. To aid with the better understanding of the results and outcome, the generalization graphs were divided into three phases. The three phases were baseline phase, treatment average phase and the generalization phase. In the baseline phase, the participants' unscripted responses were represented. In the treatment average, averages of the number of the scripted and unscripted conversation spoken by the participants' , throughout the treatment, were calculated and graphed. In the generalization phase, the participants' scripted and

unscripted responses were represented. Further, the data on generalization at the new place and with a new person was represented on the graph. A dotted line divided the baseline and treatment average phases and a solid line divided the treatment average and generalization phase. Further, a dotted line separated the data of generalization data with a new person and at a new place.

Each participant had a set of two graphs, one for the high motivation condition and the second for the low motivation condition. The conditions were represented on the graph with the symbols described in the sections above, i.e., MO+ representing the high motivation condition and MO- representing the low motivation condition. In addition to representing the motivation condition, the specific stimulus was also specified on the bottom right hand side of the graph.

Figures 6 (a) and (b), indicated the various responses of Andrew and Richard in the generalization conditions, respectively. Following is a sample generalization graph representing various components, without the data:

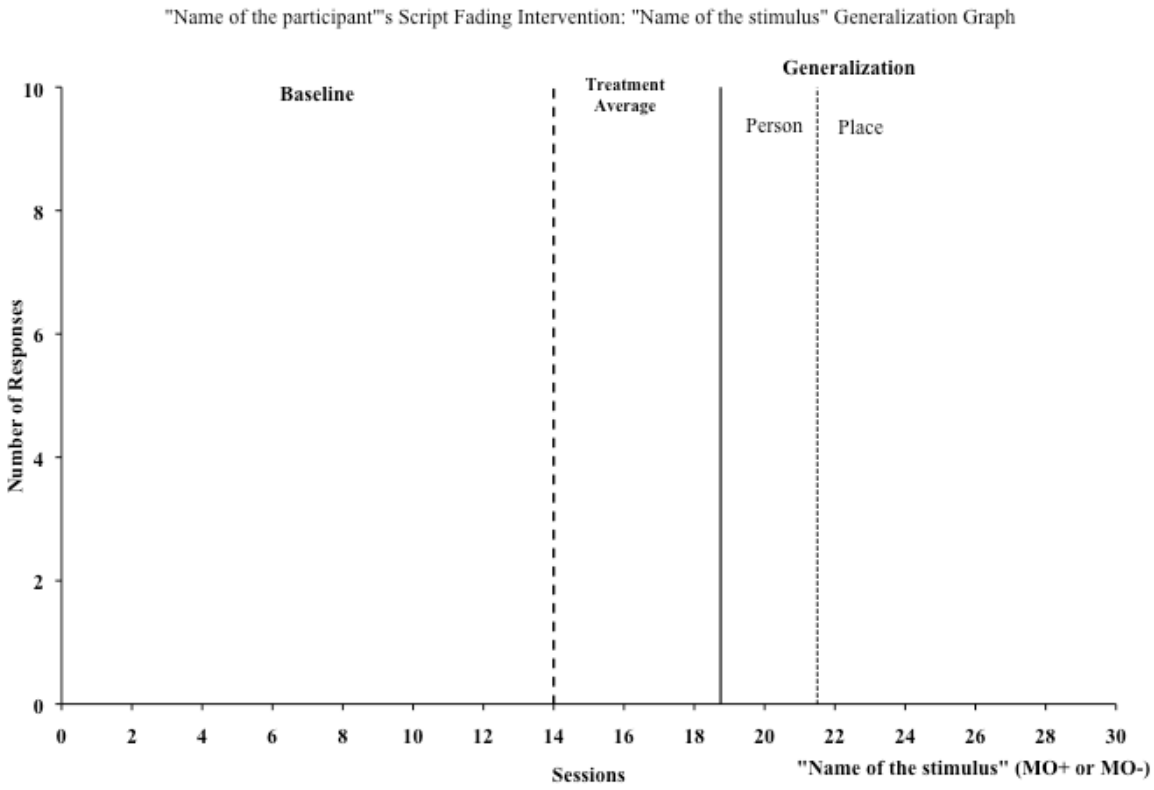


Figure 8 (c): Sample generalization graph.

Chapter 4: Results

The purpose of this study was to determine the effectiveness of motivation on the acquisition of conversational skills in children with autism spectrum disorder. The results are discussed in three main sections. First, the results of the various study phases, i.e., baseline, card reader training, treatment and script fading sessions are reported. Second, results from the generalization phase are described to determine if there was a generalization of the acquired skills. To help with better illustration of the results, the term "probes" will be used for sessions that were conducted with items not included in the treatment but used to assess generalization across stimuli. Finally, additional measures including social validity and percentage of overlapping data points are discussed.

Results from Various Study Phases

Baseline. During baseline, two of the three participants maintained low and stable rates of responding, which is the unscripted conversation (see Figures 4(a), 5(a) and 4(b), 5(b)). The third participant, Jennifer, displayed higher and more variable rates of responding in the sessions with two items: trucks (see Figure 5(c)) and tracing shapes (see Figure 4(c)). This was especially noted for the first few sessions in the baseline condition. However, low and stable rates were achieved for these stimuli at the end of the baseline phase. Jennifer's responses ranged from zero to nine in the various baseline sessions. For Andrew, the baseline unscripted responses ranged from zero to three across all the four stimuli (see Figures 4(a) and 5(a)). For Richard, the baseline unscripted

responses ranged from zero to one across all the four stimuli conditions (see Figures 4(b) and 5(b)). None of the participants engaged in a complete conversation during baseline.

Card Reader Training. Following the baseline phase, all the participants completed the second phase of the study, which was the card reader training phase. The training for Andrew and Richard was completed in one phase. Andrew completed this training in a total of 36 sessions and Richard completed this training in a total of 17 sessions. However, Jennifer was trained to use the card reader in two separate training phases. For Jennifer, the first phase was completed in a total of three sessions and the second training was completed in 12 sessions.

Andrew's responses during the training ranged from 0% independence to 100% independence. Richard's responses ranged from 70% independence to 100% independence. Finally, Jennifer's responses ranged from 0 to 100% independence across the two trainings.

Figures 7(a), (b) and (c) show a graphical representation of the card reader training for Andrew, Richard and Jennifer, respectively. Along the x-axis are the training sessions and along the y-axis are the percent correct, which is the number of trials completed by the participant independently divided by the total number of trials and multiplied by hundred. A vertical dotted line on the graph indicated change in the delivery of the social reinforcement.

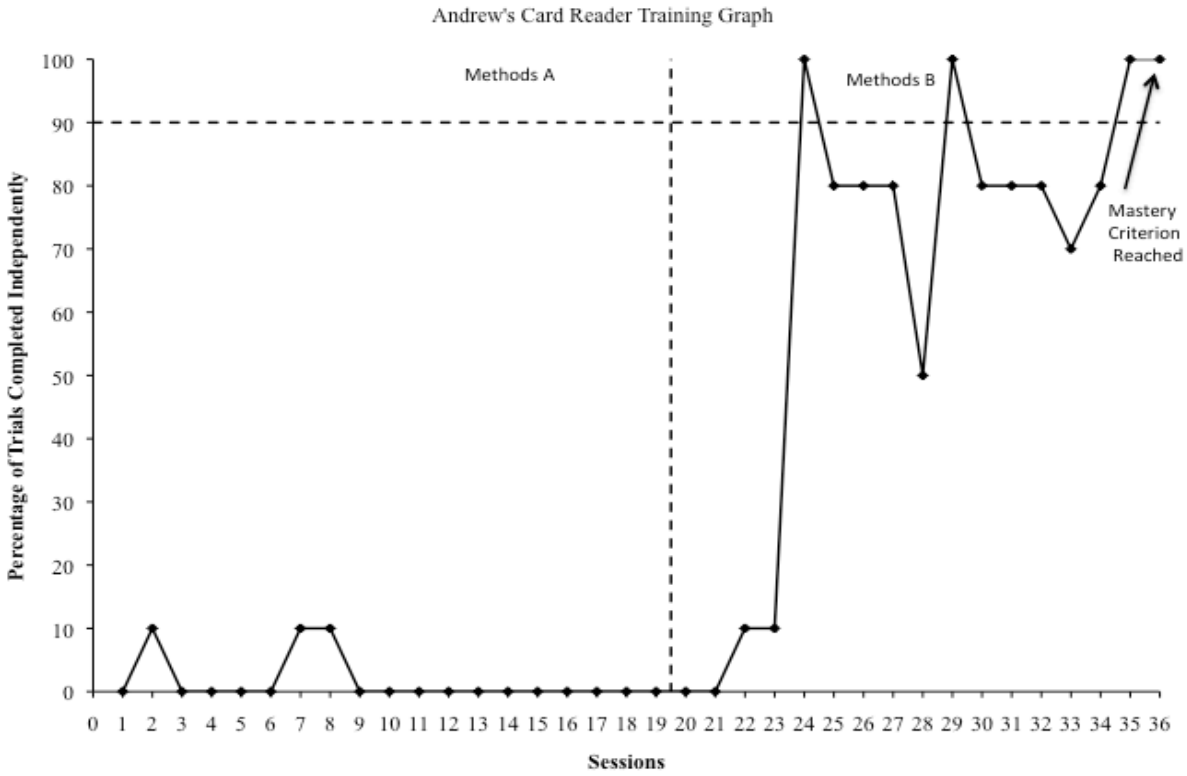


Figure 7(a): Andrew's card reader training graph.

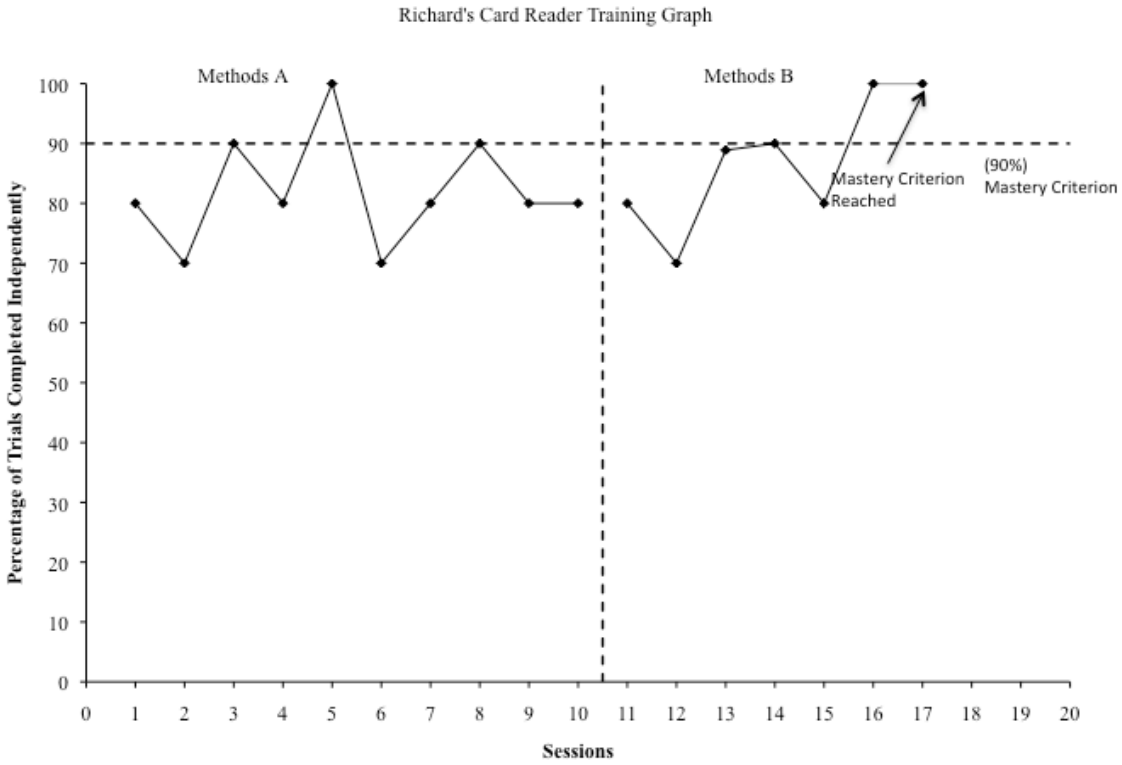


Figure 7(b): Richard's Card Reader Training Graph

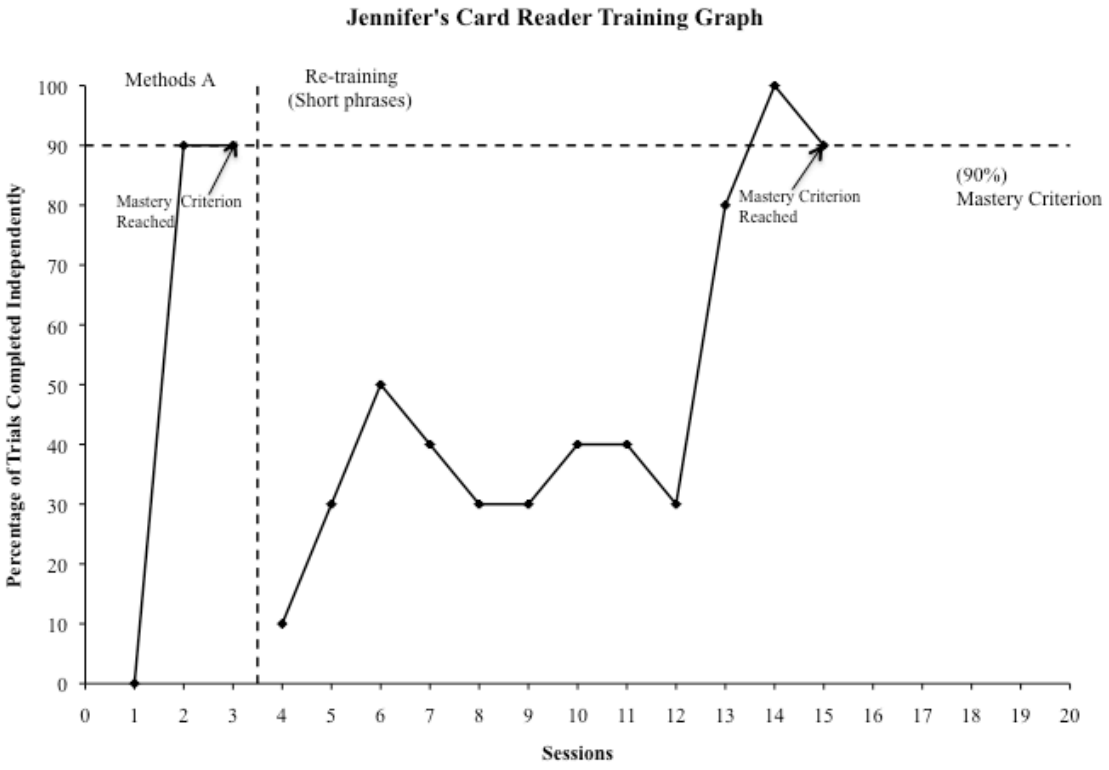


Figure 7(c): Jennifer's card reader training graph.

Treatment. Using a non-concurrent multiple baseline design, the treatment was first initiated for Andrew, followed by Richard and Jennifer respectively.

Andrew. The treatment for "Cutting shapes" started at session number 18 with the complete script (see figure 4(a), top panel). Andrew was repeating all the six scripted responses from the first treatment session. After seven treatment sessions, Andrew met the criterion for initiating the script-fading procedure and Step 1 of the fading process was started. However, during this session, Andrew's "percent correct" fell to 0%, i.e., he did not use any of the three cards independently and had to be prompted. At this step, he continued to say all the six scripted conversations and his unscripted responses increased to five responses. Since Andrew did not use any of the card independently, following the

script fading decision rule for the next session, the treatment was re-initiated at the previous step (i.e., whole script).

The intervention using the "whole script" continued for "Cutting shapes," for another 16 sessions, following which the Step 1 in the fading process was reinitiated. The treatment at Step 1 of the fading process continued for the next eight sessions and Andrew then met the criterion for Step 2 of the fading process. Andrew then meet the criterion for fading Step 3 after four sessions, Step 4 after 10 sessions, Steps 5, 6, 7, 8, 9 and 10 after only three sessions each. Step 10 was the last step in the fading process. Andrew completed all the fading steps in a total of 66 sessions before the generalization sessions were conducted. During the various fading steps, Andrew's scripted conversation ranged from four to six responses, and the unscripted responses ranged from zero to five responses.

The treatment for "Kid-Pix video games" started at session number 17 with the complete script (see figure 4(a), bottom panel). Just like in the "Cutting shapes" condition, Andrew was repeating all the six scripted responses from the first session. Additionally, his unscripted responses in the sessions using the whole script, ranged from zero to two. After 11 treatment sessions, Andrew met the criterion for initiating the script fading procedure and Step 1 of the fading process was started. However, during this session, Andrew's "percent correct" of using the card reader independently fell to 0%. At this step, Andrew's scripted responses also fell to four responses and his unscripted responses were zero. For the next session, the treatment was re-initiated at the previous step (i.e., whole script).

The intervention using "whole scripts" continued for the "Kid-Pix video game" for the next 13 sessions. At the end of the 13th session, Andrew met the criterion to reinitiate the fading process, starting with Step 1. The treatment at Step 1 of the fading process continued for the next five sessions and Andrew quickly met the criterion for Step 2 script fading. Andrew subsequently met the criterion for fading Steps 3 through 10 in only three sessions each. Step 10 was the last step in the fading process. Andrew completed all the fading steps in a total of 57 sessions before the generalization sessions were conducted. During the various fading steps, Andrew's scripted conversation ranged from three to six responses and the unscripted responses ranged from zero to two responses.

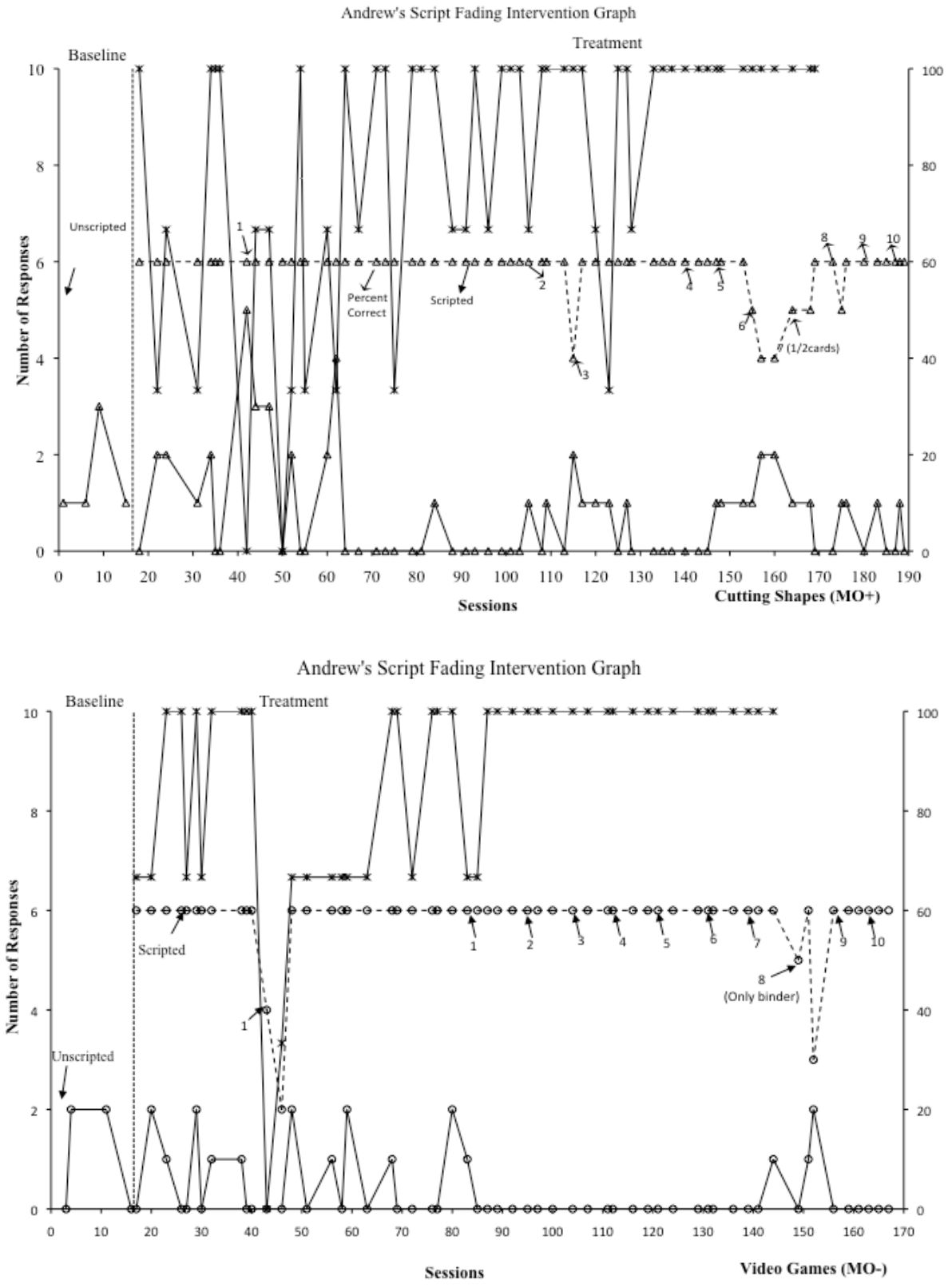


Figure 4(a): Andrew's script fading intervention graphs

Richard. The treatment for "Mickey Mouse movie" started at session number 21 with the whole script. Richard was only repeating one of the six scripted responses for the first three treatment sessions. Since Richard did not make any gains in repeating the rest of the scripted conversation, a model prompt was added starting with the treatment session. As part of the model prompt, the prompter provided a model prompt which consisted of completing the entire behavior chain after physically prompting Richard to swipe the card 10 times through the card reader. The model included picking up the card, swiping the card, emitting the script, putting the card back on the sheet and turning the page. After making this modification, there was an increase in the number of scripted responses repeated by Richard from one to three responses. Richard continued to make gains in repeating the scripted responses and the responses subsequently increased from one to six scripted responses. However, Richard was not consistent in repeating all the scripted conversation and was experiencing particular difficulty in repeating the last script of the conversation "Can we watch the movie?" More specifically, Richard was unable to repeat the word "we" included in the script. Following this observation, a modification to this script was made. As part of this modification, the word "we" was replaced with the word "I", such that the new script read "Can I watch the movie?" After making this modification, Richard was consistently repeating all the six scripted conversations.

Richard met the criterion to initiate Step 1 of the fading process after 47 sessions with the whole script. Richard met the criterion to start Step 2 of the fading process after only five treatment sessions. The Step 3 of the fading process started after six sessions at Step 2. However, at Step 3, Richard's "percent correct" of using the card reader independently, fell to 0% and the fading process was reverted back to Step 2 in the next

treatment session. Richard quickly met the criterion to re-initiate the Step 3 fading process. The fading for Step 4 was started after six sessions at Step 3. The fading for Step 5 was started after four sessions, and the fading for Steps 6, 7, 8, 9 and 10 where quickly initiated after only three sessions each. Step 10 was the last step in the fading process. Richard completed all the fading steps in a total of 95 sessions before the generalization sessions were conducted. During the various fading steps, Richard's scripted conversation ranged from one to six responses, and the unscripted responses ranged from one to two responses.

The treatment for "Baby songs" started at session number 22 with the whole script. Just like the sessions with the "Mickey Mouse movie," Richard was only repeating one of the six responses for the first three treatment sessions. A similar modification was made, and a model prompt was introduced starting with the next treatment session. Following this modification there was an increase in the number of scripted responses repeated by Richard from one to three. Richard continued to make gains in repeating the scripted responses and the responses following the modification increased from zero to six. However, just like the sessions with the "Mickey Mouse movie," Richard was inconsistent in repeating all the scripts and was also having difficulty in repeating the word "we" in the script "Can we listen to the song?" A modification similar to the "Mickey Mouse movie" script was made and the word "we" was replaced with "I". The new script read, " Can I listen to the song?" Following this modification, Richard was consistently repeating all the six scripted conversations.

Richard met the criterion to initiate Step 1 of the fading process after 57 sessions with the whole script. Richard then met the criterion to start Step 2 of the fading process after

only five treatment sessions. The Step 3 of the fading process also quickly started after three treatment sessions. After seven treatment sessions at Step 3, Step 4 of the fading process was initiated. It took three treatment sessions to start Step 5 of the fading process; eight sessions to start Step 6 of the fading process; four sessions to start Step 7; three sessions each for Steps 8, 9 and 10. Step 10 was the last step in the fading process. Richard completed all the fading steps in a total of 99 sessions before conducting the generalization session. During the various fading steps, Richard's scripted conversation ranged from one to six responses and the unscripted responses ranged from zero to one response.

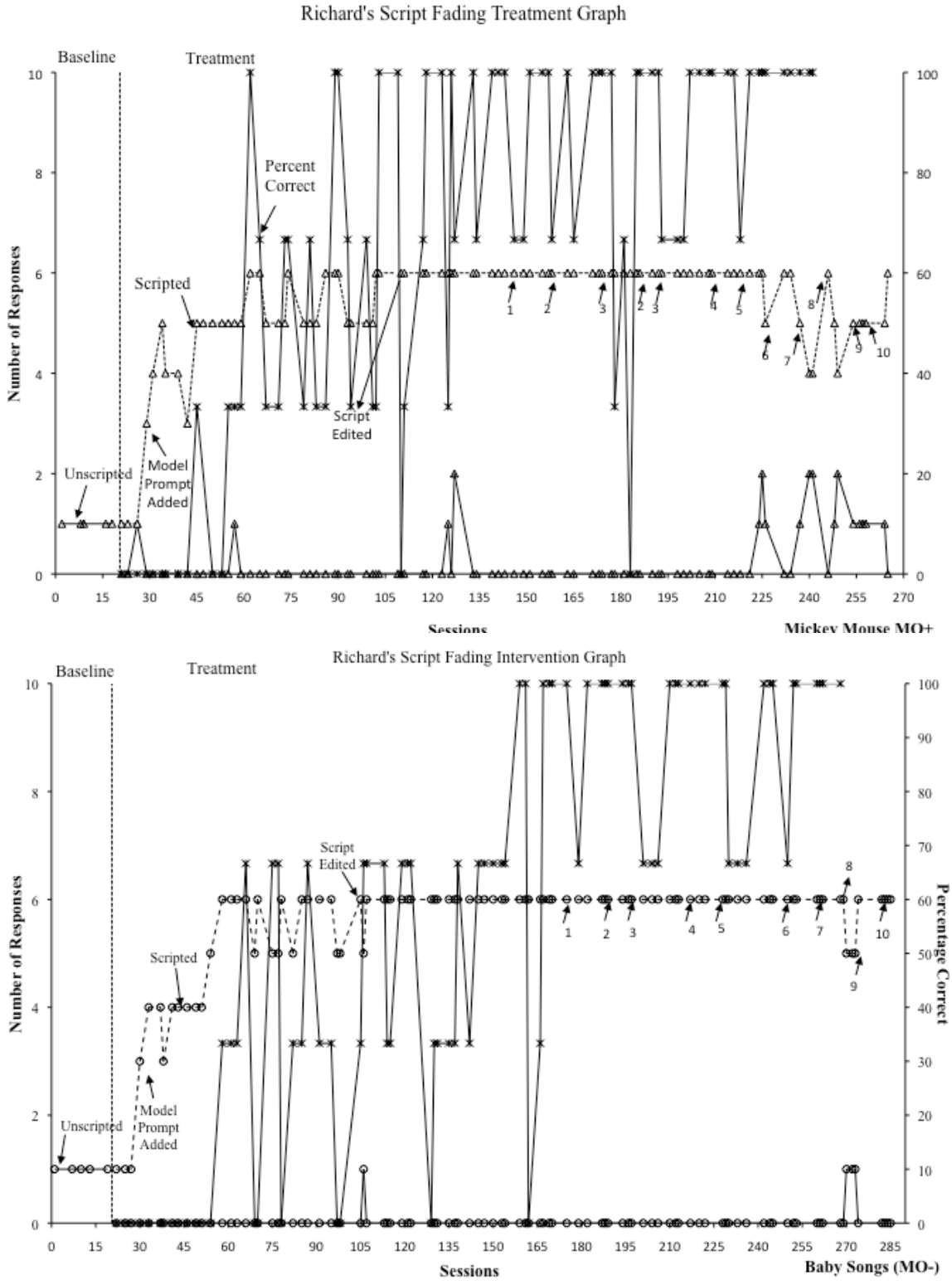


Figure 4(b). Richard's Script Fading Intervention Graphs

Jennifer. The treatment for "Miscellaneous Songs" started at session number 25 with the whole script. Jennifer was repeating five to six scripted responses for the treatment sessions. However, after three treatment sessions, Jennifer's scripted conversation was not consistent at six responses and her "percent correct" of using the card reader independently only ranged from 0 to 33.3%. This means that Jennifer was not only inconsistent in repeating all the scripts, but also was unable to use the card reader independently.

Jennifer's responses during the treatment condition "Drawing shapes" was along similar lines. The treatment for "Drawing shapes" started at session number 28 with the whole script. Jennifer's scripted responses in this condition ranged from three to six responses. After three treatment sessions, Jennifer's scripted responses were not consistent at six responses and the "percent correct" only ranged from 0 to 33.3%.

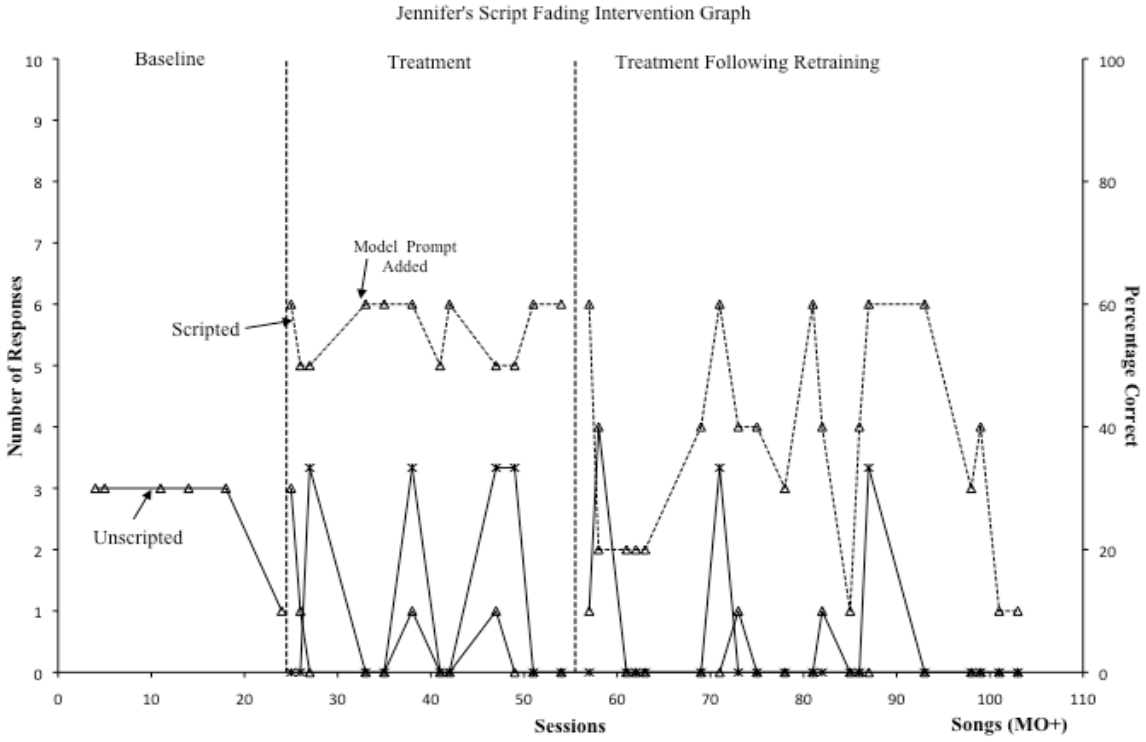
Following these responses in the sessions with "Miscellaneous songs" and "Drawing shapes", a model prompt was added on the 4th treatment session of both the conditions. Following this modification, nine treatment sessions were completed for the two conditions, "Miscellaneous songs" and "Drawing shapes." However, Jennifer failed to show any improvement in repeating the scripted conversation and in the "percent correct" of using the card reader independently. Jennifer's scripted conversation continued to stay between five or six responses for "Miscellaneous songs" and three to six for "Drawing shapes" and her "percent correct" of using the card reader stayed between 0 to 33.3% for both the conditions.

Since Jennifer did not make any progress in using the card reader, the treatment sessions were terminated at session number 54 for "Miscellaneous songs" and 55 for

"Drawing shapes". Following this termination, a second card reader training was started. Since Jennifer completed the previous training with words in only three sessions, it was decided to use short phrases (see Figure 7(c)).

After the card reader training was completed, the treatment was initiated at session number 57 for "Miscellaneous songs" and 59 for "Drawing shapes". Following the retraining, a total of 16 treatment sessions were completed for "Miscellaneous songs" and 15 treatment sessions were completed for "Drawing shapes." During these sessions, Jennifer's scripted conversation continued to say inconsistent and ranged from two to six scripted responses for both the "Miscellaneous songs" and the "Drawing shapes" conditions. Additionally, Jennifer's "percent correct" of using the card reader continued to stay low and between 0 to 33.3% for "Miscellaneous songs" and 0 and 100% for "Drawing shapes". This means that following the re-training, Jennifer was unable to repeat the scripts heard from the card reader and was also unable to use the card reader independently.

Since Jennifer was not able to make progress during either of the two conditions after a total of 57 sessions and two card reader trainings, the study was terminated for Jennifer, and it was concluded that this intervention was not appropriate for Jennifer.



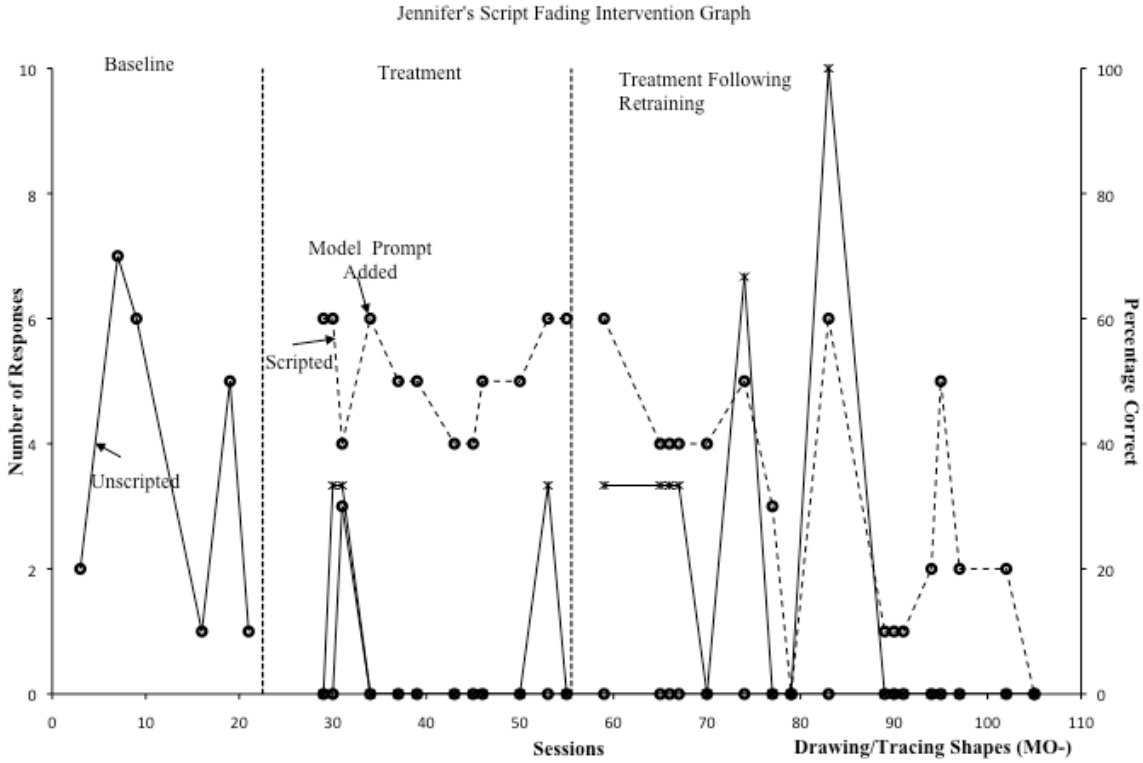


Figure 4(c): Jennifer's script fading intervention graphs.

Probe Sessions. Probes sessions similar to the baseline sessions, were conducted with one MO+ stimulus and one MO- stimulus throughout the intervention phase. The probe sessions were completed for all the three participants.

Andrew. The probe sessions were completed for two new stimuli, "Writing" (MO+) and "Reading" (MO-).

For the sessions with "Writing," Andrew's unscripted responses ranged from one response in a session to 10 responses in a session. Andrew's unscripted responses, following the initiation of treatment with another stimulus, were greater than his responses during the baseline condition, which ranged from zero to one unscripted response per session. In addition to an increase in the total responses during the sessions, Andrew was also able to engage in a complete conversation, which consisted of three unscripted responses within 15 seconds of each other. Andrew engaged in a total of 22 complete conversations out of 24 probe sessions for "Writing" (MO+). Andrew's unscripted responses included answers and questions directed towards the conversational partner. Some of the questions asked by Andrew during the probe sessions were, "Can we copy the words together?", "What words are on the list?" etc.

For the sessions with "Reading," Andrew's unscripted responses during the probe sessions ranged from three to eight responses per session. Andrew's unscripted responses following the initiation of treatment with another stimulus were greater than his responses during the baseline condition, which ranged from zero to one unscripted response. In addition to an increase in the total responses during the session, Andrew was also able to engage in a complete conversation. Andrew engaged in a total of 18 complete conversations out of 22 probe sessions with "Reading." Just like his generalization

sessions with “Writing,” Andrew’s responses consisted of responses and questions directed towards the conversational partner. Some of the questions asked by Andrew in the “Reading” condition included, “Are you a good reader?”, “ Yes, do you like to read?”, “Ms. Geetika, are you a good reader?” etc.

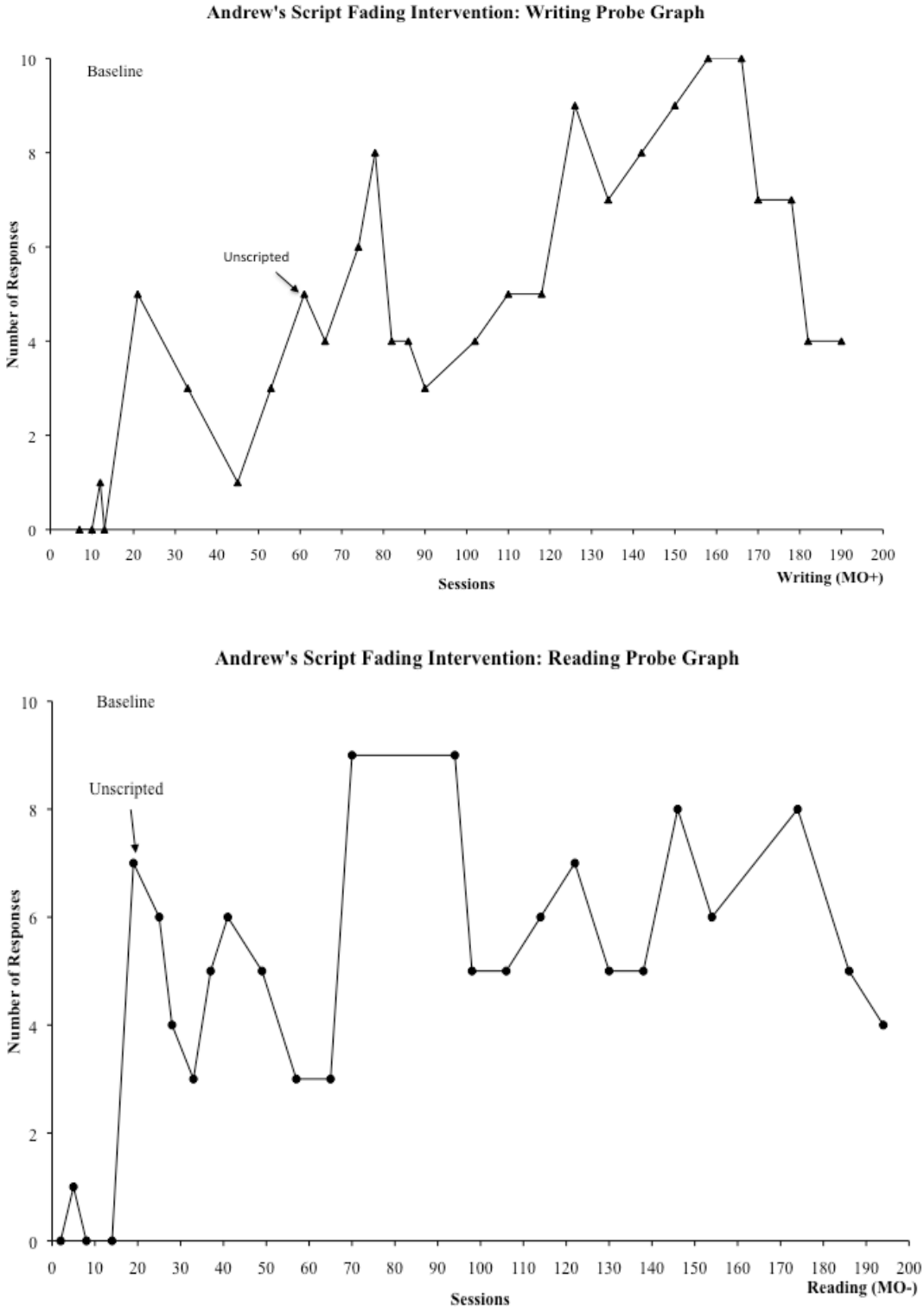


Figure 5(a): Andrew's script fading intervention: Probe graphs.

Richard. The probe sessions were completed for two stimuli, "Grains" (MO+) and "Writing" (MO-).

For the probe sessions with "Grains", Richard's unscripted responses ranged from one to nine responses in a session. In addition to an increase in the total number of unscripted responses during the probe sessions, Richard was able to engage in a few complete conversations. Richard engaged in a total of three complete conversations out of 31 probe sessions.

For the probe sessions with "Writing," Richard's responses during also ranged from one to nine responses. Similar to the "Grains" conditions, there was an increase in the total number of unscripted responses spoken by Richard during the probe sessions with "Writing." Richard was also able to engage in complete conversations during some of the probe sessions. Richard engaged in a total of 15 complete conversations out of 32 probe sessions. This means that Richard engaged in a complete conversation a little less than 50% of the time.

These results indicated that while Richard was able to generalize some of the learned skills to both the sessions with "Grains" (MO+) and "Writing" (MO-), the gains were more evident during the probe sessions with "Writing."

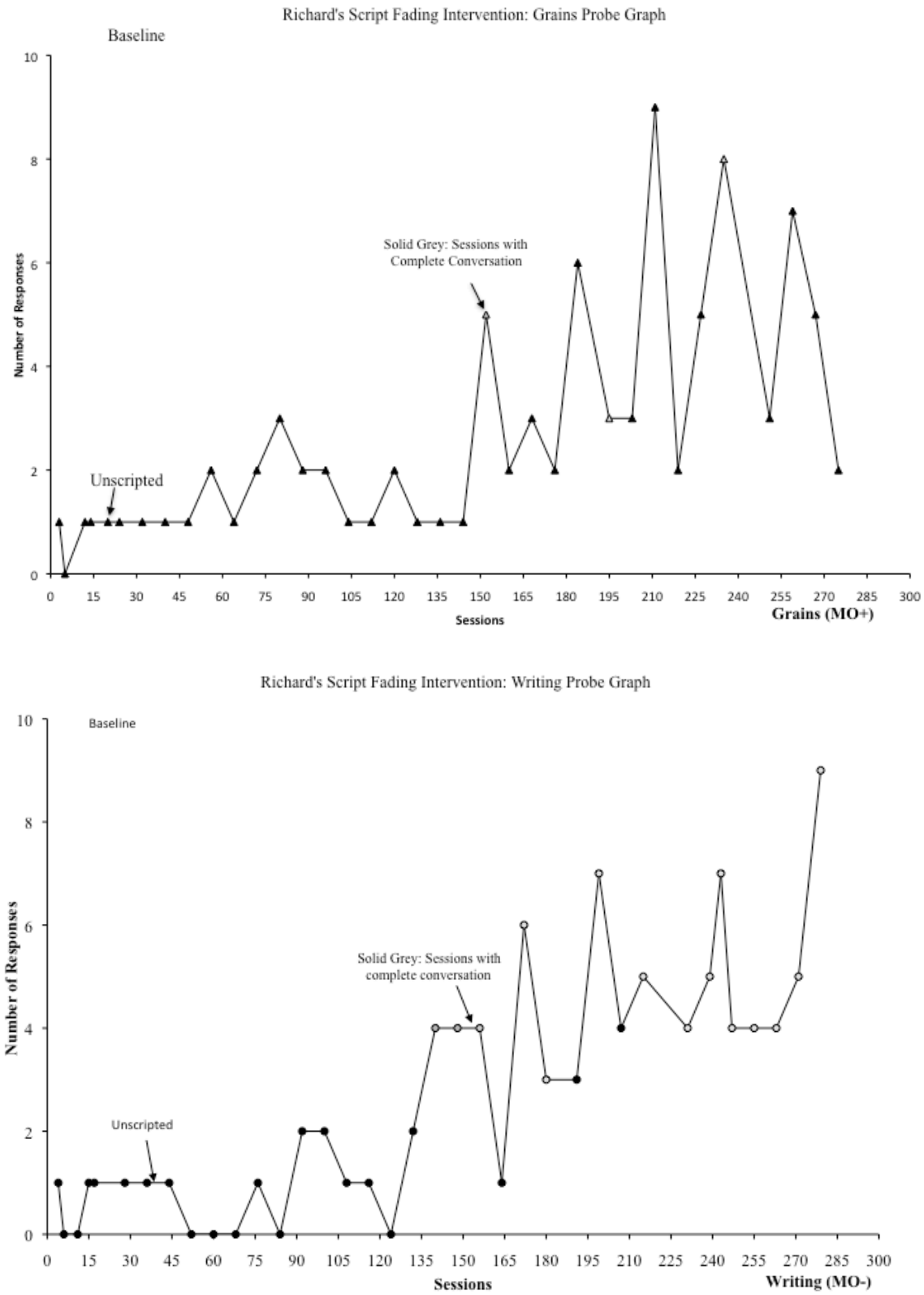
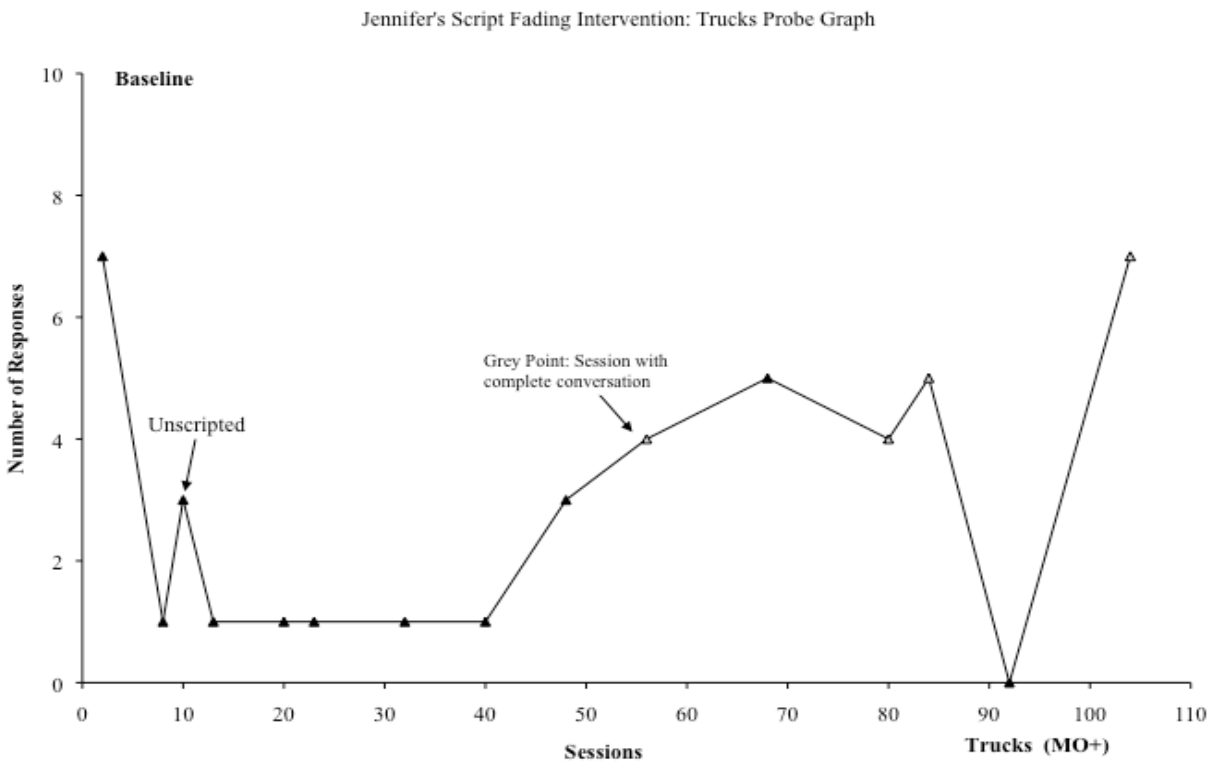


Figure 5(b): Richard's script fading intervention: Probe graphs.

Jennifer. The probe sessions were completed for the two stimuli, "Trucks" (MO+) and "Cutting shapes" (MO-).

For the probe sessions with "Trucks," Jennifer's unscripted responses ranged from zero to seven unscripted responses during a session. These were similar to Jennifer's baseline level responses, and she did not show any gains in the number of unscripted responses following the initiation of treatment with another stimulus. Although the number of unscripted responses did not increase for Jennifer, she was able to engage in complete conversation four times out of nine probe sessions or 44% of times.

For the probe sessions with "Cutting shapes," Jennifer's unscripted responses were very variable and ranged from zero to 17 unscripted responses in a session. Although the average number of unscripted responses spoken by Jennifer were higher following the introduction of treatment with another stimulus (Average baseline = 1.7 unscripted responses; Average probe = 7.44 unscripted responses), the variable and inconsistency in her unscripted responses do not indicate a strong generalization of the learned skill in the probe sessions with "Cutting shapes."



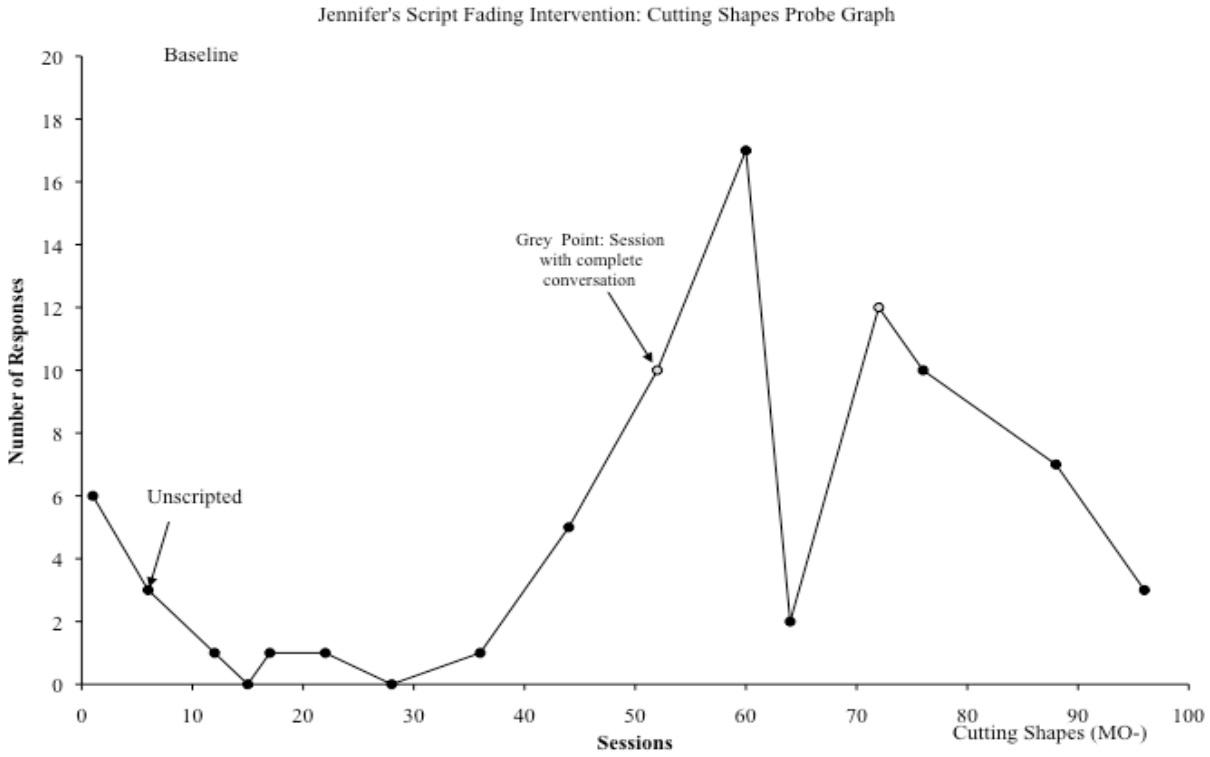


Figure 5(c): Jennifer's script fading intervention: Probe graphs.

Generalization: New Place and New Person. Only two participants completed all the phases of the study. Hence, generalization across a new person and a new place was only assessed for Andrew and Richard.

Andrew. For assessing the generalization of the acquired skill with a new person, a new therapist from Marcus Autism Center served as the conversational partner. During the "Cutting shapes" condition, Andrew continued to engage in the scripted conversation. During these sessions, Andrew did not emit any unscripted response. Similarly, during the "Kid-Pix video game" condition, Andrew continued to engage in scripted conversation and also emitted two unscripted responses. These results indicated that Andrew was able to successfully generalize the scripted conversational skills with the new therapist in both the conditions.

For assessing the generalization in a new setting, the sessions were conducted in the clinic hallway. During the "Cutting shapes" condition, Andrew continued to engage in scripted conversation for two of the three sessions. For one of these three sessions, Andrew engaged in six unscripted conversation where he talked about "Cutting letters." Andrew responded to the questions asked by the conversational partner and provided appropriate responses to this conversation about "Cutting letters."

During the "Kid-Pix video games" condition, Andrew continued to engage in the scripted conversation for all the three sessions. Andrew also emitted one unscripted response during this phase of generalization. These results indicated that Andrew was able to successfully generalize the scripted conversation to a new setting in both the conditions. In addition to this, Andrew was also able to engage in a completely unscripted conversation about "Cutting letters" in a "Cutting shapes" condition at a new setting.

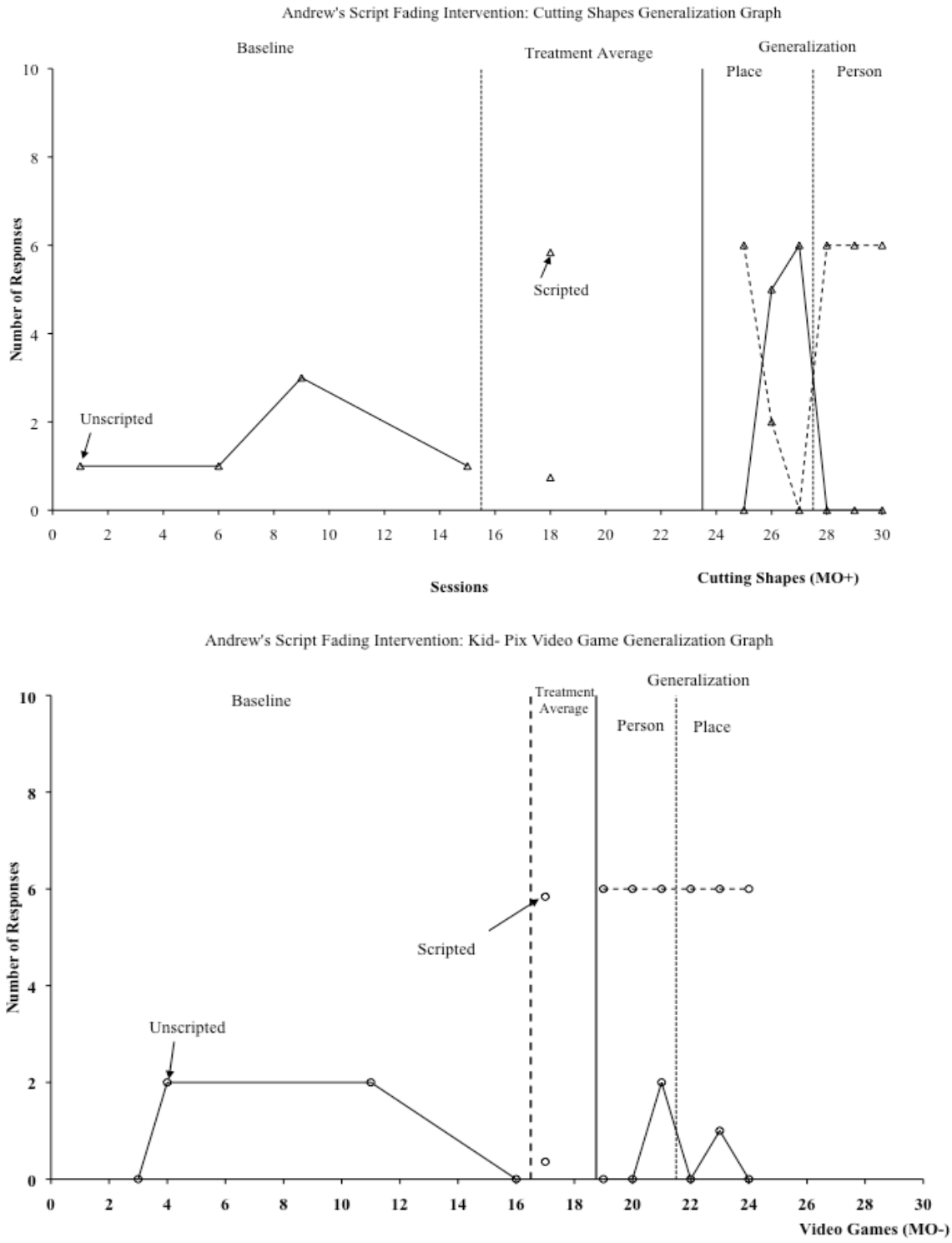


Figure 6(a): Andrew's script fading intervention: Generalization graphs

Richard. For assessing generalization with a new person, a new therapist from Marcus Autism Center served as the conversational partner. During the "Miscellaneous songs" condition, Richard continued to engage in both the scripted and unscripted conversations. There were no changes in Richard's acquired conversational skills following the introduction of a new conversational partner. Similarly, during the "Mickey Mouse movie" condition, Richard continued to engage in both the scripted and unscripted conversations similar to the treatment sessions. These results indicate that Richard was able to generalize the acquired skill with a new conversational partner for both the conditions.

Finally, the generalization to a new setting was assessed in the hallway of the clinic. During the "Mickey Mouse movie" condition, Richard continued to engage in the conversation, which consisted of both the scripted and unscripted sentences previously spoken in the treatment sessions. Similarly, during the "Songs" condition, Richard continued to engage in the conversation which consisted of both the scripted and unscripted sentences similar to those spoken in the treatment sessions. These results indicate that Richard was able to generalization the scripted and unscripted conversation to a new setting for both the conditions.

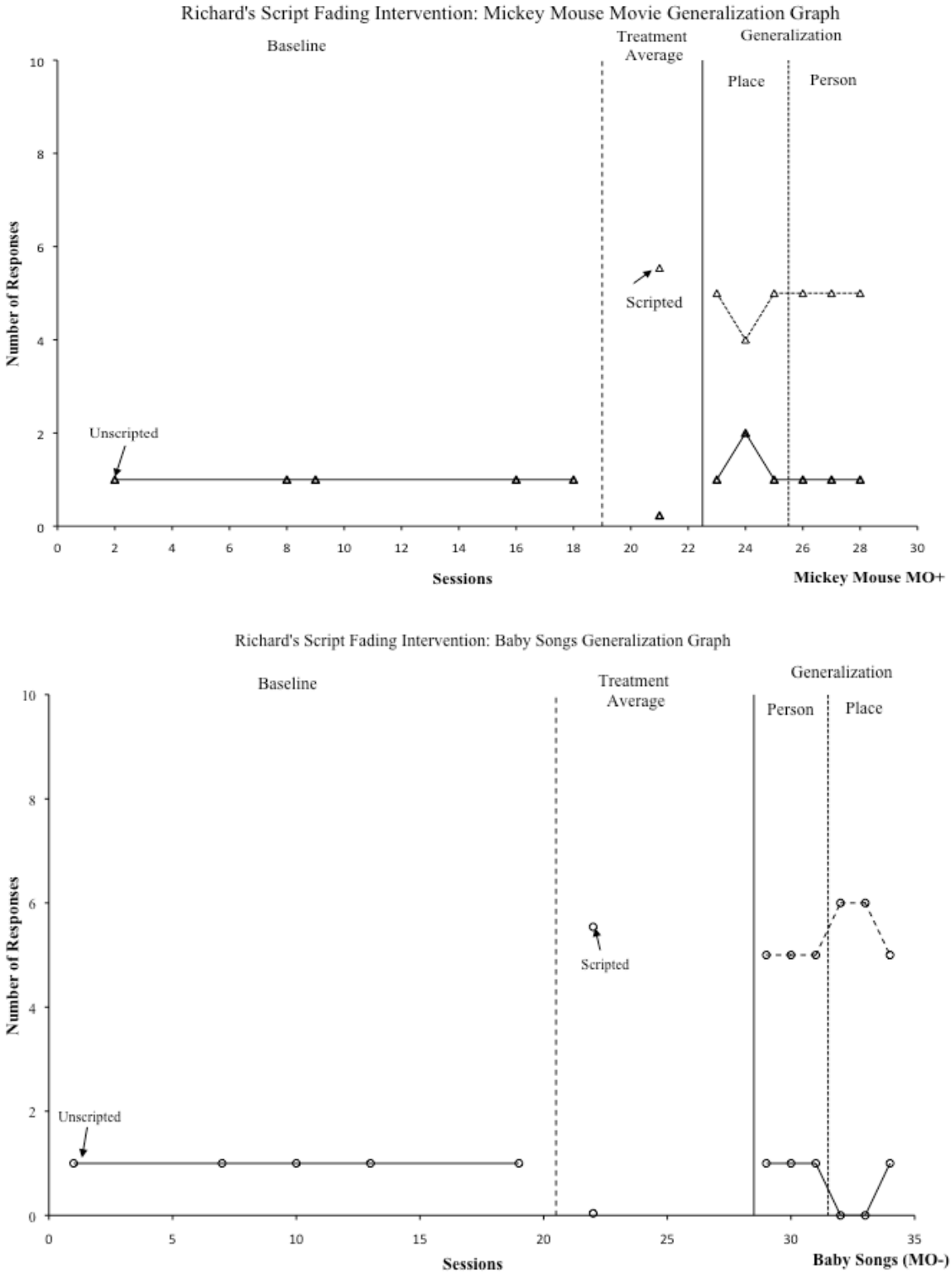


Figure 6(b): Richard's script fading intervention: Generalization graphs.

Percentage of Non-Overlapping Data Points. The percentage of non-overlapping data points (PND) was calculated to assess the effectiveness of the intervention for each of the participants (Scruggs & Mastropieri, 1998). The PND scores were only calculated for Andrew and Richard.

The PND scores for Andrew for scripted conversation were 100% and 98.48% for the MO+ and MO- conditions, respectively. Richard's PND score for scripted conversation were 96.84% and 97% for both the MO+ and MO- conditions, respectively. These results indicated that the treatment was effective in increasing the scripted conversation for both the participants.

The PND score was also calculated for the unscripted conversation. The PND scores for both Andrew were 3.05% in the MO+ condition and 0% in the MO- condition. Richard's PND scores were 5.26% for the MO+ condition and 0% for the MO- condition, indicating that the intervention was not effective in increasing the unscripted conversation for either of the two participants.

Further, PND data was also calculated for the probe stimuli. For Andrew, the PND scores were 95.83 % and 100% for the MO+ and MO- conditions respectively, indicating that the intervention was equally effective in increasing unscripted conversation across both conditions. For Richard, the PND score for the MO+ condition was 67.74% meaning that the effectiveness of the intervention was questionable in increasing the unscripted conversation in the MO+ condition. Similarly, during the MO- condition, his PND score was 62.5%, indicating that although Richard showed some gains, the overall effectiveness of the intervention is questionable.

Social Validity. The caregivers of the three participants were asked to complete a social validity questionnaire. The questionnaire asked them about their views on the goals and effectiveness of the intervention along with their overall reaction toward the intervention. The questionnaire consisted of three questions and the caregivers were asked to provide their responses on a four-point rating scale.

The first question asked them about the importance of the goals of the planned intervention scripts and script fading. Andrew's caregiver responded by identifying that the goals of the intervention were "very important." Richard's caregiver said that the goals were "fairly important" whereas Jennifer's caregiver stated that the goals were "somewhat important."

When asked about the effectiveness of the intervention, Andrew's caregiver stated that the intervention was "very effective," Richard's caregiver stated that the intervention was "fairly effective" and Jennifer's caregiver stated that the intervention was "not at all effective."

The final question asked about their overall reaction to this intervention. Andrew's caregiver stated his/her reaction as "very positive", and both Richard's and Jennifer's caregivers stated their reactions as "fairly positive."

Chapter 5: Discussion

The purpose of this study was to assess the role of motivation on the acquisition of conversational skills by using scripts and script fading procedures. This study was designed to investigate (hypothesis 1) whether scripts based on highly preferred items increase initiation in conversation including turn-talking, responding to questions and asking questions, in comparison to low-preferred items; (hypothesis 2) whether scripts based on highly preferred items increase scripted conversational skills and (hypothesis 3) unscripted conversational skills, when compared to scripts based on low preferred items; (hypothesis 4) whether the overall acquisition is faster for topics that are preferred by the participants versus topics that are not preferred; and (hypothesis 5) whether the generalization of conversational skills is better for topics that are preferred by the participants versus topics that are not preferred.

The following section will discuss the results obtained for the research hypotheses. Since motivation was a factor in all the hypotheses, motivation will be discussed first. Following this, the limitations of this study will be discussed and the section will conclude with a discussion on the contributions of this study and directions for further research.

Role of Motivation

In our study, the role of motivation was mixed. For the majority of the hypothesis (1, 2, 4 and 5), the participants did not show an increase in initiation, increase in scripted conversation, faster learning or better generalization in the high motivation conditions when compared to the low motivation conditions.

However, motivation did seem to play a role in the unscripted conversation (hypothesis 3), and the participants showed an increase in unscripted conversation in the high motivation conditions when compared to the low motivation conditions. Although, only two of the three participants (Andrew and Richard) were able to acquire the scripted conversation during treatment, there were more unscripted conversations during the high motivation condition, even though Jennifer did not complete the treatment. This is line with the hypothesis, which stated that the children with autism will show a higher number of unscripted conversation in the scripts based on their highly preferred items compared to the scripts based on their low preferred items. This finding is also in line with the literature on motivation, which suggests that the target behavior increases during the high motivation conditions (Gutierrez, Vollmer, Dozier, Borrero, Rapp, Bourret & Gadaire, 2007; Howlett, Sidener, Progar, & Sidener, 2011; Taylor, Hock, Potter, Rodriguez, Spinnato & Kalaigian, 2005).

Further outcomes indicated that motivation, either did not influence the initiation of conversation (hypothesis # 1) or had an opposite effect; there were greater instances of initiation during the low motivation condition. Although, these findings contradict the proposed hypothesis, they are in inline with the similar studies using script-fading procedure, where the researchers did not find an increase in initiations or responses in the participants, in the absence of a systematic intervention (Brown et al., 2008; Ganz, Kaylor, Bourgeois & Hadden, 2008; Krantz & McClannahan, 1998; Krantz & McClannahan, 1993; Taylor, Hock, Potter, Rodriguez, Spinnato & Kalaigian, 2005; Taylor & Poulson, 2001).

Contradictory results were also obtained for the scripted conversation (hypothesis # 2), where the motivation did not play a role. Additionally, mixed results were obtained for the time of acquisition of the conversational skills hypothesis (hypothesis # 4), which stated that the children with autism would show quicker acquisition for the preferred scripted conversation, when compared to the scripted conversation based on the low-preferred items.

The final hypothesis of this study stated that there would be greater instances of generalization with new stimuli, settings and individuals in the highly preferred conditions, compared to scripts based on low preferred items. Only Andrew and Richard, completed the generalization phase of this study with the new therapist and at a new place.

The results from the new stimuli probe sessions indicated that Andrew and Jennifer did not show any difference in the generalization of the conversational skills across the two motivational conditions. However, Richard showed better generalization in the low motivation (writing) condition.

This discrepancy in Richard's result can be explained in two ways. First, when comparing the nature of the script, i.e., "Writing" vs. "Grains", it seems that "Writing" is a more natural activity and Richard may be more likely to have greater exposure and opportunities for conversation centered around "writing." In comparison, "Grains" seems like an unnatural and a very specific kind of activity with fewer opportunities of conversation centered on it. This difference could have affected Richard's responses during the MO- "Writing" condition. Second, there was a discrepancy in Richard's results from the paired choice preference assessment with the caregiver reporting

"Grains" as least preferred but came up as a highly preferred item during the direct assessment. The method for determining preferences will be discussed in more detail later in the discussion. These outcomes for the generalization with new stimuli are in line with a similar study by Reagon and Higbee (2009) who also reported variability in the generalization of stimuli across participants.

In terms of generalization with a new person and at a new place, both the participants (Andrew and Richard) were able to generalize the acquired skills and did not show differential responses across the two motivational conditions. A significant development came during the generalization at a new place for Andrew, where he engaged in a completely unscripted conversation. This was a significant event as Andrew was able to generalize the newly acquired skill to the new setting while speaking new and unscripted responses to engage in a conversation. The new conversation was about "Cutting letters," and the scripted conversation was about "Cutting shapes." The scripted conversation stated, "Do you like cutting shapes?" and "What is your favorite shape?" and Andrew's unscripted responses were, "Do you like cutting letters?" and "What is your favorite letter?" Similarly, Richard also spoke more unscripted responses and fewer scripted responses in the high motivation condition (Mickey Mouse movie) during the generalization at a new place phase.

Limitations of the study

These unexpected and contradictory results can be explained by some limitations that were inherent in the study. First, the participants' preferences were only identified at the start of the study and there was a lack of an ongoing assessment of the participants' preferences and interests. Although the literature on preference assessment is mixed on

the stability of an individuals' preferences across time, studies have indicated that the preferences may change over a period of time (Zhou, Iwata, Goff & Shore, 2001) and these changes may in turn lead to a decrease in the performance or excess variability in the behavior during an intervention (Hanley, Iwata & Roscoe, 2006). Further, the literature also suggests that, while time alone may not be responsible for this variability, an examination of other factors especially satiation is important as it may significantly contribute towards the changes in an individual's preferences (Hanley, Iwata & Roscoe, 2006). This leads to the second limitation of the study. Given the length of the intervention (over 100 sessions), it is possible that the repeated presentation of the same stimuli over such a long period of time set in satiation for the items previously identified as preferred. The literature suggests that satiation has been identified as a factor contributing to the greatest amount of change in an individual's preference (Hanley, Iwata & Lindberg, 1999; Hanley, Iwata, Roscoe, Thompson & Lindberg, 2003; Klatt, Sherman & Sheldon, 2000; Vollmer & Iwata, 1991). Since, most of the stimuli included in the study were not dynamic in nature (for example, cutting shapes, drawing shapes), the participants could have gotten satiated or bored, which in turn could have affecting the overall outcome of the study (Hanley, Iwata & Roscoe, 2006).

A third limitation of the study, which can be used to explain the contradictory results, was the discrepancy in the caregiver report and the outcome of the paired-choice preference assessment completed for the participants. Although a direct assessment of preference is encouraged for a more reliable outcomes on an individuals' preferences, the literature suggests that caregiver report should be considered especially significant when an individual has a few or no highly preferred items (Fisher, Piazza, Bowman & Amari,

1996; Green et al., 1991). This was certainly the case for all the three participants who either had a few highly preferred items (Andrew and Richard) or no specific item that was highly preferred (Jennifer). It is possible that the preference assessment could have lead to the identification of an incorrect or less motivating stimuli.

Contributions and Future Implications

There are several important contributions of this study to the existing literature. In light of the limitations of this study, there are several important implications for the future research.

First, the study could only be completed with two of the three participants. This outcome helped us understand that although the participants may meet the inclusion and exclusion criterion, the intervention may not be effective for all of them. Identifying other factors may affect the effectiveness of a particular intervention need to be more fully examined. Our study also highlights the need to have criteria to determine when intervention should stop and the participant should begin other interventions. Future studies should include more individuals so that the outcomes are generalizable to the larger population. Future studies should also re-visit the recruitment criterion so that all the participants are also to complete the targeted intervention.

Second, this study clearly highlighted the importance of successfully and reliably completing the pre-intervention training like the training for using the card reader and using such a device for the intervention. However, this training might have also slowed the pace of the study as several sessions were spent on training and re-training the participants to use this card-reader. Time was spent throughout the study to make sure that the participants did not lose this acquired skill. Despite this extensive training and

tracking procedure, one of the participants could not use the card reader independently, which underscores the need to explore more user-friendly technologies in the future research that is also easy to incorporate in the teaching procedures.

Third, we also learned that the participants' existing repertoire of answering questions influenced the completion of the conversational exchange. This is an important factor to be considered in future research and the scripted conversations should try to incorporate the responses that are already part of the participants' repertoire.

Finally, we also learned that the caregiver report is very important in considering a child's preferences. There were several discrepancies in the caregivers' report of participants' preferences and the results obtained from the paired-choice preference assessment. Future research should further assess and resolve these discrepancies. Also, future research should try to use a more dynamic assessment in order to identify stimuli that are truly preferred or not preferred. This can be achieved in several ways. First, the participant could be asked about their choice of topic for the conversation in the session. This can be done before starting the intervention and can address ongoing changes in the participant's preferences. Howlett et. al., (2011) used a dynamic assessment to determine the order of various sessions by they presented a "choice board" to the participant before starting each session. Reagon and Higbee (2009) also used an ongoing Multiple Stimuli Without replacement (MSWO) method of preference assessment (Deleon & Iwata, 1996) to determine the target stimulus in a session. This assessment was completed before starting the intervention each day. As part of this assessment, the participant was presented with an array of preferred item and was asked to "pick one." The first item picked from the array was considered highly preferred and was removed the array. The

participant was then asked to “pick another one.” Like the previous trial, the choice was noted and the item was removed from the array. This procedure continued until only one item was remaining in the array. The order of choice was noted and was used to determine the target stimulus for the treatment sessions. A similar method of preference assessment, that is both dynamic and ongoing, can further control for the changes in the preferences over the period of time. It can also control for satiation that might set in during the course of a lengthy intervention.

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Appendices

Appendix A

Parent Report of Conversational Skills

Directions:
For each of the following statements, encircle the appropriate box that best describes your child's behavior over the past 6 months. Use a 5-point rating scale to provide your responses.

Please use the following description when providing your responses.

1- Never
2- Rarely (e.g., no more than once in 6 months)
3- Occasionally/Infrequently (e.g., average of once every two to three months)
4- Frequently (e.g., average of several times a week)
5- Very Frequently (e.g., occurs everyday or several times a day)

Please read the statements below and provide your responses.	Responses				
	1	2	3	4	5
1. Is able to imitate short phrases and sentences (e.g., 2-3 word phrases).	1	2	3	4	5
2. Responds to a novel or new question with a single word.	1	2	3	4	5
3. Responds to a novel or new question with a short phrase.	1	2	3	4	5
4. Will spontaneously ask questions.	1	2	3	4	5
5. Has difficulty with conversational turn taking.	1	2	3	4	5
6. Will make comments related to the conversational topic.	1	2	3	4	5
7. Has difficulty staying on the topic of the conversation.	1	2	3	4	5
8. Will change the subject of the conversation to topics of their interest.	1	2	3	4	5
9. Has difficulty maintaining a conversation.	1	2	3	4	5
10. Will initiate conversation with adults.	1	2	3	4	5
11. Will initiate conversation with peers.	1	2	3	4	5

Appendix B

Teacher Report of Conversational Skills

Directions:
For each of the following statements, encircle the appropriate box that best describes your student's behavior over the past 6 months. Use a 5-point rating scale to provide your responses.

Please use the following description when providing your responses.

1- Never
2- Rarely (e.g., no more than once in 6 months)
3- Occasionally/Infrequently (e.g., average of once every two to three months)
4- Frequently (e.g., average of several times a week)
5- Very Frequently (e.g., occurs everyday or several times a day)

Please read the statements below and provide your responses.	Responses				
	1	2	3	4	5
1. Is able to imitate short phrases and sentences (e.g., 2-3 word phrases).	1	2	3	4	5
2. Responds to a novel or new question with a single word.	1	2	3	4	5
3. Responds to a novel or new question with a short phrase.	1	2	3	4	5
4. Will spontaneously ask questions.	1	2	3	4	5
5. Has difficulty with conversational turn taking.	1	2	3	4	5
6. Will make comments related to the conversational topic.	1	2	3	4	5
7. Has difficulty staying on the topic of the conversation.	1	2	3	4	5
8. Will change the subject of the conversation to topics of their interest.	1	2	3	4	5
9. Has difficulty maintaining a conversation.	1	2	3	4	5
10. Will initiate conversation with adults.	1	2	3	4	5
11. Will initiate conversation with peers.	1	2	3	4	5

Appendix C

Assessment of Verbal Imitation Skills

Instructions for list of words:

_____(Child's name), I am going to say some words one at a time. Once I speak the word, I want you to repeat the word after me.

Let's practice:

Scenario 1:
Therapist: Say "apple".
Child's correct response: Apple.
Therapist: Very good. Let's try some more words. (Therapist will start with first word on the list).

Scenario 2:
Therapist: Say "bag".
Child's incorrect response: Say bag.
Therapist: Remember to only say the word. Let's try again. Say "bag".
Child's incorrect response: Say bag.
Therapist: (Therapist eliminate instruction "say" and only present the word). Let's try again "bag".
Child's correct response: Bag.
Therapist: Very good. Let's try some more words. (Therapist will start with first word on the list without the instruction "say").

Words	Correct Imitation (Y) or (N)	Words	Correct Imitation (Y) or (N)
Book		Computer	
Water		Birthday	
Cheetos		Reach	
Music		Microwave	
Swing		Pencil	

Instructions for list of sentence:

_____(Child's name), I am going to say a short sentence one at a time. Once I speak the sentence, I want you to repeat the sentence after me.

Let's practice:

Scenario 1:
Therapist: Say "you play with toys".
Child's correct response: "You play with toys."
Therapist: Very good. Let's try some more sentences. (Therapist start will with first sentence on the list).

Scenario 2:
Therapist: Say "you play with toys".
Child's incorrect response: Say you play with toys.
Therapist: Remember to only say the sentence. Let's try again. Say "you play with toys".
Child's incorrect response: Say you play with toys.
Therapist: (Therapist eliminate instruction "say" and only present the sentence). Let's try again "you play with toys".
Child's correct response: you play with toys.
Therapist: Very good. Let's try some more sentences. (Therapist will start with first sentence on the list without the instruction "say").

Sentences	Correct Imitation (Y) or (N)	Sentences	Correct Imitation (Y) or (N)
You drink water		Apple is a fruit	
A dog says woof		I want to read	
You sleep in a bed		Ball is round	
You throw a ball		He kicked the ball	
My name is _____		A fish swims in water	

Appendix D

Parent Report of Child Problem Behavior

Directions:
Following is a list of problem behaviors organized in three broad categories: aggression, disruption and self-injurious behavior. Use a 5-point rating scale to indicate the frequency of your child's problem behavior in each of these three categories. Circle the appropriate box in the columns provided below. Think about the behavior in the past 6 months when filling out this form.

Please use the following description when providing your responses.

1- Never
2- Rarely (e.g., no more than once in 6 months)
3- Occasionally/Infrequently (e.g., average of once every two to three months)
4- Frequently (e.g., average of several times a week)
5- Very Frequently (e.g., behaviors occurs everyday or several times a day)

Problem Behavior	Mark the frequency (see table above)				
	1	2	3	4	5
Aggression (towards adults)					
Hitting	1	2	3	4	5
Kicking	1	2	3	4	5
Biting	1	2	3	4	5
Scratching	1	2	3	4	5
Screaming	1	2	3	4	5
Pushing	1	2	3	4	5
Throwing things	1	2	3	4	5
Self-injurious behaviors					
Biting	1	2	3	4	5
Head banging	1	2	3	4	5
Scratching	1	2	3	4	5
Skin picking	1	2	3	4	5
Hitting any body part	1	2	3	4	5
Disruption					
Throwing things	1	2	3	4	5
Kicking things	1	2	3	4	5
Breaking things	1	2	3	4	5
Tearing things	1	2	3	4	5
Banging things	1	2	3	4	5
Damaging things	1	2	3	4	5

Appendix E

Reinforcement Assessment for Individuals with Severe Disabilities (RAISD)

Student's Name: _____

Date: _____

Recorder: _____

The purpose of this structured interview is to get as much specific information as possible from the informants (e.g., teacher, parent, caregiver) as to what they believe would be useful reinforcers for the student. Therefore, this survey asks about categories of stimuli (e.g., visual, auditory, etc.). After the informant has generated a list of preferred stimuli, ask additional probe questions to get more specific information on the student's preferences and the stimulus conditions under which the object or activity is most preferred (e.g., What specific TV shows are his favorite? What does she do when she plays with a mirror? Does she prefer to do this alone or with another person?)

We would like to get some information on _____'s preferences for different items and activities.

1. Some children really enjoy looking at things such as a mirror, bright lights, shiny objects, spinning objects, TV, etc. What are the things you think _____ most likes and dislikes to watch?

   Response(s) to probe questions:

2. Some children really enjoy different sounds such as listening to music, car sounds, whistles, beeps, sirens, clapping, people singing, etc. What are the things you think _____ most likes and dislikes to listen to?

   Response(s) to probe questions:

3. Some children really enjoy different smells such as perfume, flowers, coffee, pine trees, etc. What are the things you think _____ most likes and dislikes to smell?

   Response(s) to probe questions:

4. Some children really enjoy certain food or snacks such as ice cream, pizza, juice, graham crackers, McDonald's hamburgers, etc. What are the things you think _____ most likes and dislikes to eat?

   Response(s) to probe questions:

Fisher, W. W., Piazza, C. C., Bowman, L. G., & Amari, A. (1996). Integrating caregiver report with a systematic choice assessment. *American Journal on Mental Retardation, 101,* 15–25.

5. Some children really enjoy physical play or movement such as being tickled, wrestling, running, dancing, swinging, being pulled on a scooter board, etc. What activities like this do you think _____ most enjoys and does not enjoy?

Response(s) to probe questions:

6. Some children really enjoy touching things of different temperatures, cold things like snow or an ice pack, or warm things like a hand warmer or a cup containing hot tea or coffee. What activities like this do you think _____ most enjoys and does not enjoy?

Response(s) to probe questions:

7. Some children really enjoy feeling different sensations such as splashing water in a sink, a vibrator against the skin, or the feel of air blown on the face from a fan. What activities like this do you think _____ most enjoys and does not enjoy?

Response(s) to probe questions:

8. Some children really enjoy it when others give them attention such as a hug, a pat on the back, clapping, saying "Good job", etc. What forms of attention do you think _____ most enjoys and does not enjoy?

Response(s) to probe questions:

9. Some children really enjoy certain toys or objects such as puzzles, toy cars, balloons, comic books, flashlight, bubbles, etc. What are _____'s favorite and least preferred toys or objects?

Response(s) to probe questions:

10. What are some other items or activities that _____ really enjoys and does not enjoy?

Response(s) to probe questions:

Fisher, W. W., Piazza, C. C., Bowman, L. G., & Amari, A. (1996). Integrating caregiver report with a systematic choice assessment. *American Journal on Mental Retardation, 101,* 15–25.

After completion of the survey, select all the stimuli which could be presented or withdrawn contingent on target behaviors during a session or classroom activity (e.g., a toy could be presented or withdrawn, a walk in the park could not). Write down all of the specific information about each selected stimulus on a 3" x 5" index card (e.g., likes a female adult to read him the 'Three Little Pigs' story.) Then have the informant(s) select the 16 stimuli and rank order them using the cards. Finally, list the ranked stimuli below. Complete this process for preferred and un-preferred activities/items.

1. _____ 9. _____
2. _____ 10. _____
3. _____ 11. _____
4. _____ 12. _____
5. _____ 13. _____
6. _____ 14. _____
7. _____ 15. _____
8. _____ 16. _____

Notes:

Fisher, W. W., Piazza, C. C., Bowman, L. G., & Amari, A. (1996). Integrating caregiver report with a systematic choice assessment. *American Journal on Mental Retardation, 101,* 15–25.

Appendix F

Data Sheet: Participant's Use of Card Reader

Data Sheet: Participants Use of Card Reader

Participant ID: _____ Date: _____ Time Start:____ Time End:____
Training Session #: _____ Pri DC_____ Reli DC: ____ Promter___ Phase I / II

Script (# of phrase)	Pick card (a)	Swipe card (b)	Say audio script (c)	Return card (d)	Turn Page (e)	Prompt (I/M/P)
1						(I/M/P)
2						(I/M/P)
3						(I/M/P)
4						(I/M/P)
5						(I/M/P)
6						(I/M/P)
7						(I/M/P)
8						(I/M/P)
9						(I/M/P)
10						(I/M/P)
Total # Independent						
% Independent						

Definition of target behaviors:
Pick card (a): Remove the card attached to the sheet
Swipe card (b): Swipe the magnetic script card in the card reader
Say audio script (c): Repeat the audio script emitted by the card reader
Return card (d): Place the card back on the sheet to which it was attached
Turn page (e): Turn the page with the current script such that the next page is now visible

Appendix G

Data Sheet: Baseline Condition

Baseline

P. ID#		Date		Session #	
Conv. Part		Prompter		Script	
Primary DC		Reli DC		Notes	

Requesting for items/ Other verbalizations	Responses

Appendix H

Data Sheet: Treatment Condition

Treatment		Time start:		Time end:	
P. ID		Date		Session #	
Conv. Part		Prompter		Script	
Primary DC		Reli. DC		Script Fading Step	

Scripted Interaction			Unscripted Interaction	
	Correct	Swipes	Related to the script	Unrelated to script
Script 1				
I /M/ P				
a/ b/ c/ d/ e				
Script 2				
I /M/ P				
a/ b/ c/ d/ e				
Script 3				
I /M/ P				
a/ b/ c/ d/ e				
# Scripted			# Unscripted	

Target behaviors:

Pick card (a): Swipe card (b): Say audio script (c): Return card (d): Turn page (e)

Appendix I Glossary

Abative effect (of motivating operation): A decrease in the current frequency of behavior that has been reinforced by the stimulus tat is increased in reinforcing effectiveness by the same motivating operations. For example, food ingestion abates (decreases the current frequency of) behavior that has been reinforced by food.

Echolalia: A language difficulty common to the autistic-spectrum disorders, as well as some other disabilities, echolalia refers to the tendency to repeat previously heard speech. This can be:

1. Immediate (you say "what color?" and the person immediately repeats back "what color?")
2. Delayed (the person repeats an utterance heard minutes, hours, days, weeks, months, or even years ago)

Establishing operations (EO): A motivating operation (MO) that alters the value or the effectiveness of some stimulus, object, or event as a reinforcer. Reinforcing effectiveness refers only to the extent to which any type of behavior that preceded the occurrence of such an event would show a future increase in frequency the next time the situation was the same as it was when the event followed that type of behavior. The alteration in reinforcing effectiveness can be up or down, thus the reinforcer establishing/abolishing effect.

Evocative effect (of motivating operation): An increase in the current frequency of behavior that has been reinforced by the stimulus that is increased in reinforcing effectiveness by the same motivating operations. For example, food deprivation evokes (increases the current frequency of) behavior that has been reinforced by food.

Functional Communication Training: An antecedent intervention in which an appropriate communicative behavior is taught as a replacement behavior for problem behavior usually evoked by an establishing operation (EO); involves differential reinforcement of alternative behavior.

Joint attention: Refers to two individuals sharing an experience. This term is often used in discussions of individuals with socialization difficulties. The ability to say or respond to, for example, "look at that!" and share an experience with another individuals is assumed to be crucial for social development.

Non-concurrent multiple baseline design: The non-concurrent design, unlike the more traditional concurrent design, involves the observation of different individuals at different times. In this design, data are not collected simultaneously and allows the participants to be evaluated at different points in time.

Raspberries: This is a non-speech sound, typically emitted by infants between the ages of four to six months.

Self-modeling: An interesting approach to video modeling has been the incorporation of "self" as the videotaped model. Self-modeling can be defined as a procedure in which people see themselves on videotapes showing only adaptive behavior.

Script: A script is an audio-taped or written word, phrase, or sentence that enables young people with autism to start or continue conversation.

Script fading: Script fading is a behavior approach that involves the introduction and systematic fading of the scripts.

Theory of Mind: A number of research studies have explored autistic children's ability to impute mental states such as beliefs, desires, and intentions to others, and to

themselves or to have a theory of other people's (and their own) subjectivity- a *theory of mind* (ToM; Baron-Cohen, Tager-Flusberg, & Cohen, 1999). The major hypothesis emerging from this work is that individuals with autism lack this capability.

Video modeling: Video modeling is a behavioral technique that uses videotapes rather than live scenarios for the child to observe, thus allowing the focus of attention to be concentrated on the stimulus tape. This is a procedure of videotaping targeted behaviors in order to explain the learner's capability to memorize, imitate and generalize or adapt targeted behaviors.

Tables

Table 1

Behavior Chain for the Trial

Step	Participant will …
1.	Pick up the card from A4 sheet.
2.	Slide the card through the card reader.
3.	Repeat the script emitted from the card reader.
4.	Place the card back on the sheet.
5.	Turn the page.

Table 2

Steps in Script Fading

Fading Step	Recorded script on the card (original script "Do you like cutting shapes?")
Step 1	"Do you like cutting "
Step 2	"Do you like "
Step 3	"Do you"
Step 4	"Do"
Step 5	Empty Card
Step 6	Card cut in half
Step 7	No card (only ring binder)
Step 8	Half ring binder (front removed)
Step 9	No ring binder

Table 3

List of items (in the order of their ranking) included in the preference assessment

Andrew

Ranking	Preferred Items	Non-Preferred Items
1	Computer games (Kid Pix)	Math
2	Drawing pictures	Reading books
3	Cutting shapes	Completing puzzles
4	Cutting pictures (pbs kids/sam's club)	Copying words/sentences

Richard

Ranking	Preferred Items	Non-Preferred Items
1	Mickey mouse series	Reading
2	Phineas and Felb series	Coloring
3	Baby songs/music	Writing
4	Blocks/ lego	Grains/rice

Jennifer

Ranking	Preferred Items	Non-Preferred Items
1	Misc. Songs	Pasting Pictures
2	McDonald Cash Register	Cutting Shapes
3	Trucks	Tracing Shapes
4	Water in different cups	Tracing Letters

Table 4 a

Scripts Used by Participant 1 Andrew

Scripts: Treatment	Scripts: Generalization
Script: Cutting shapes (MO+)	Script: Writing (MO+)
E*: Do you like cutting shapes?	E: Do you like to write?
C#: Yes. Do you like cutting shapes?	C: Yes. Do you like to write?
E: I do. What is your favorite shape?	E: I do. What words did you write?
C: Square. What is your favorite shape?	C: ____. What do you like to write?
E: I like circles. Are you good at cutting shapes?	E: Stories. Do you like to copy words?
C: I am. Can we cut shapes together?	C: Yes. Can we copy the words together?
E: Sure.	E: Sure.
Script: Kid-Pix Video games (MO-)	Script: Reading (MO-)
E: Do you like to play video games?	E: Do you like to read?
C: Yes. Do you like video games?	C: Yes. Do you like to read?
E: I do. What video game is on this computer?	E: Yes. What book did you just read?
C: Kid-pix. What game do you like?	C: The five-little monkeys. What books do you like?
E: I like car games. Are you good at kid-pix?	E: I like picture books. Are you a good reader?
C: Yes. Can we play it together?	C: Yes. Can we read together?
E: Sure.	E: Sure.

*E: Experimenter; # C: Child/Participant

Table 4b

Scripts used by participant 2 Richard

Scripts: Treatment	Scripts: Generalization
Script: Mickey Mouse movie (MO+)	Script: Grains (MO+)
E*: Do you like to watch a movie?	E: Do you like to play with grains?
C#: Yes. Do you like movie?	C: Yes. Do you like grains?
E: I do. What is your favorite movie?	E: I do. What is your favorite grain?
C: Mickey mouse. What is your favorite movie?	C: Rice. What is your favorite grain?
E: I like SpongeBob. Do you watch other movies?	E: I like rice too. Do like other grains?
C: Yes. Can I watch the movie?	C: Yes. Can we play with grains together?
E: Sure.	E: Sure.
Script: Baby songs (MO-)	Script Writing (MO+)
E: Do you like listening to songs?	E: Do you like to write?
C: Yes. Do you like songs?	C: Yes. Do you like to write?
E: I do. What is your favorite song?	E: I do. What do you write with?
C: Baby song. What is your favorite song?	C: Pencil. What else do you write with?
E: I like instrumental. Do you listen to other songs?	E: A pen. Do you want to write these words?
C: Yes. Can I listen to the song?	C: Yes. Can we write together?
E: Sure.	E: Sure.

*E: Experimenter; # C: Child/Participant

Table 4c

Scripts used by participant 3 Jennifer

Scripts: Treatment	Scripts: Generalization
Script: Songs (MO+)	Script: Trucks (MO+)
E*: Do you like to sing songs?	E: Do you like to play with trucks?
C#: Yes. Do you like to sing songs?	C: Yes. Do you like to play with trucks?
E: I do. Where do you sing songs?	E: I do. Why would you use a truck?
C: At school. What is your favorite song?	C: To carry things. What else can you do?
E: The Muffin-man. Do you listen to other songs?	E: Drive from one place to another. Do you want to drive the truck?
C: Yes. Can we listen to the songs?	C: Yes. Can we play with it together?
E: Sure.	E: Sure.
Script: Drawing Shapes (MO-)	Script: Cutting Shapes (MO-)
E: Do you like to draw shapes?	E: Do you like to cut shapes?
C: Yes. Do you like to draw shapes?	C: Yes. Do you like to cut shapes?
E: I do. What is your favorite shape?	E: I do. What is your favorite shape?
C: A heart. What is your favorite shape?	C: Square. What is your favorite shape?
E: I like square. Are you good at drawing shapes?	E: I like rectangle. Are you good at cutting shapes?
C: Yes. Can we draw the shapes together?	C: Yes. Can we cut the shapes together?
E: Sure.	E: Sure.

*E: Experimenter; # C: Child/Participant

Figures

Figure 1 Layout of the Session Room

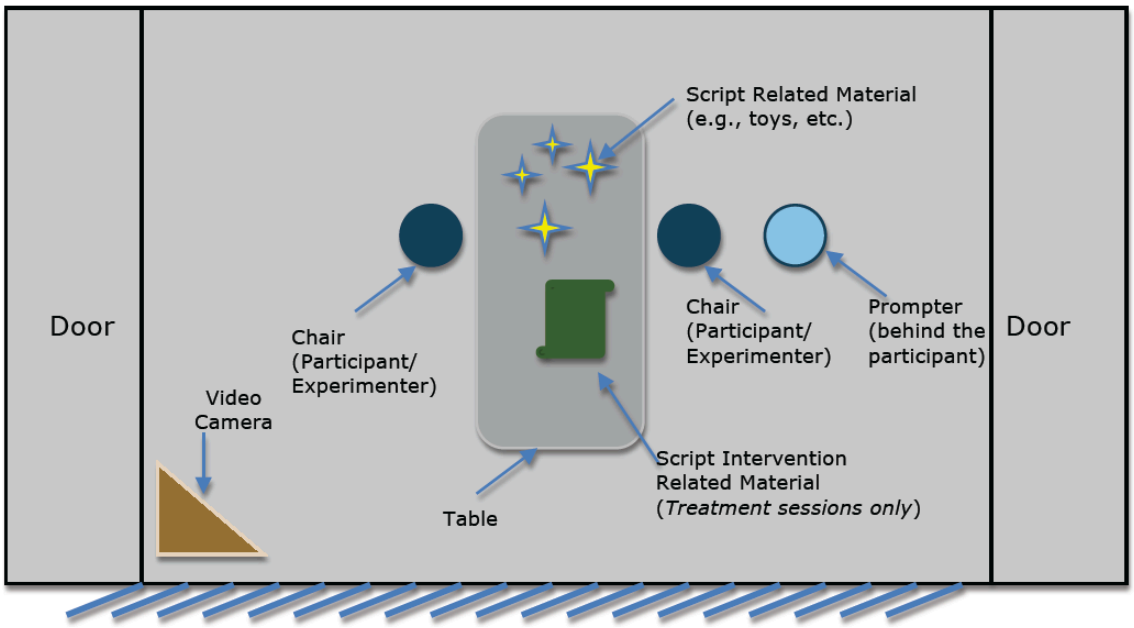

Figure 2 Califone Card Reader

Picture courtesy Kaplan Learning Company (http://www.kaplanco.com/).

VITA

Geetika Agarwal, daughter of Yashodha and Pushpal Agarwal, was born in New Delhi, India. Following her graduation from the N.C. Jindal Public School in 1998 with a major in biology, she attended Indraprastha College for Women, University of Delhi and graduated with Bachelors of Arts in psychology honors. In 2001, she went on to obtain the Masters of Arts in Clinical Psychology from the University of Delhi with scholarship. She decided to pursue her passion in clinical and child psychology and joined a doctorate program in School Psychology at the University of Missouri in 2004. During her graduate program, she worked as an implementer of ABA based skill acquisition programs for children with autism at the Thompson Center for Autism and Neuro-developmetal Disabilites. Geetika moved to Atlanta, GA and worked as a behavior technician at the Marcus Autism Center, Atlanta, GA. She completed her APA accredited internship at the Marcus Autism Center and went on to obtain her certification as a behavior analyst. Geetika works as an independent behavioral consultant and designs skill acquisition programs for children with autism. She is also an instructor of online courses on applied behavior analysis.