Effects of script fading on the abilities of children with autism to reciprocate information

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EFFECTS OF SCRIPT FADING ON THE ABILITIES
OF CHILDREN WITH AUTISM TO
RECIPROCATE INFORMATION

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ABSTRACT

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Teaching communication skills to children with autism is a primary concern because speech and/or language delay characterize autism. One method of teaching verbal communication skills to children with autism is script fading.

This study examined the effects of teaching children with autism to exchange information to peers about objects and pictures using script fading. Six children with autism were recruited from a special program for children with autism at a public elementary school. Participants were formed into dyads that remained intact throughout the study. Two dyads consisted of first grade students, one dyad consisted of a second and a fifth grade student. Prior to the study participants were screened for minimum reading and language skills using the Woodcock-Johnson III Letter-Word Identification and Passage Comprehension subtests; and the Expressive One Word Picture Vocabulary Test and Receptive One Word Picture Vocabulary Test.
In a multiple baseline across participants design students were taught to exchange information about objects using script fading. Later, a script about pictures was introduced and the two scripts were taught in a rapidly alternating fashion. The frequency of scripted and unscripted statements, and non-responses were measured. Scripts were faded in five steps. In the last step only the conversational referents were present. Once scripts were completely faded novel objects and pictures were introduced; all participants demonstrated generalization.

Results show that script fading had an effect on scripted statements made during intervention. Script fading did not have a strong effect on unscripted statements made during intervention. Most unscripted statements that were noted were not elaborations of the scripts. All participants were able to generalize the scripts to novel objects and pictures.

Findings of this study reveal that script fading is effective for teaching children with autism to reciprocate information to peers about objects and pictures. Additionally, script fading is effective for teaching conversational skills that generalize to novel objects and pictures. This study used a parsimonious procedure that can be replicated by general practitioners. Because this study was conducted in a public school it provides support for the effectiveness of script fading with a general population of children with autism.
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CHAPTER 1

INTRODUCTION

One of the three defining characteristics of autism is “...qualitative impairments in communication...” (p. 58) (American Psychological Association, 1994). Because autism is diagnosed by measuring observable behaviors and not through biological markers, many interventions for autism have been designed to change behavior not physiology. These interventions are generally designed to mitigate the three observable symptoms of autism.

The types of communication impairment that can be expected from children with autism include, “...echolalia, mutism, and failure to use abstract terms” (Hulit & Howard, 2002, p. 377). The implications of communication impairments are far reaching. For instance, children with autism, “…have difficulty establishing the kind of mutual attention that is necessary for communicative exchanges” (Hulit & Howard, p. 378). Children with autism also have difficulty using language to initiate and inform both of which are necessary skills to possess in order to maintain social interactions (Wetherby, 1986).

Wetherby (1986) reported data from an earlier study (Wetherby & Prutting, 1984) to indicate that communicative actions taken by subjects with autism outnumbered those of a control group of typically developing children when measured against a list of nine communicative intents identified by the authors. Their data show that children with
autism exhibited as many communicative intents, and sometimes more, than the typically developing control group children in the study. However, the topography of communicative behaviors of children with autism is often challenging. Communication impairment can also lead to an increased propensity of aggressive and self-injurious behaviors (Sigafoos, 2000).

Sigafoos (2000) "...examined the relationship between communication development and aberrant behavior in 13 children with developmental disability.” Sigafoos found a strong correlation between challenging behavior and communication. He concluded that higher levels of communication ability are associated with lower levels of challenging behavior. Sigafoos observed that, "...delayed or impaired communication development may contribute to the emergence of aberrant behavior in young children with developmental delay” (p. 5).

Researchers and practitioners have pursued a variety of communication interventions to provide children with autism a means of expressing themselves. Many of these interventions have had evidence to support their potential efficacy to increase communication behavior. However, some communication interventions for autism have first found popularity in the public arena before being tested for effectiveness under controlled circumstances. Lord (2000) noted that when this happens, science often takes a detour to determine the efficacy of these programs. Unfortunately, Lord noted, results from research projects often take a much longer time to reach publication than do unsubstantiated interventions that use the popular media and the internet to disseminate. The result can often lead to the implementation of communication interventions that are not effective and possibly detrimental.
An example of this phenomenon was the widespread popularity of an intervention that claimed to allow children with severe disabilities to communicate through a non-disabled facilitator and a keyboard. This intervention, known as Facilitated Communication, was introduced to the autism intervention community in 1990 by Bilken (cited in Seigel, 1995). The intervention quickly gained popularity in the autism intervention community (Lord, 2000) yet its efficacy had not been demonstrated through empirical research. In some cases there were even instances of unsubstantiated allegations of sexual molestation made through Facilitated Communication which led to major disruptions of family life (Seigel). This example highlights the necessity of finding research based interventions for communication disorder in autism that can be easily implemented by practitioners with robust results. Having these interventions will discourage people from attempting unproven communication interventions for children with autism.

Fortunately, there are many research based intervention to teach communication skills to children with autism. Examples include augmentative communicative instruments (e.g., Picture Exchange Communication System [Bondy & Frost, 1994]) and treatment packages (e.g., Keen, Sigafoos & Woodyatt, 2001) that combine interventions to teach communication skills to children with autism. Some communication interventions for children with autism use common treatment techniques that have been used for many years such as modeling, shaping, time delay, and the principals of reinforcement (Ogletree, 2007).

Among communication interventions for autism there is a concentration of effort on a particular intervention that appears promising to improve verbal communication
skills for children with autism. This intervention involves teaching verbal communication skills by teaching individuals with autism to read lines of a written script aloud that are meaningful in context. The students are often taught these scripts in a meaningful context. As students become more proficient in reading their script the written prompt is systematically faded by removing some of the words from the paper. The expectation is that students will repeat the learned verbal behaviors in context because the utterance often elicits a desired, or reinforcing, response. This intervention is akin to actors learning lines of a script, and likely explains why Krantz & McClannahan (1993) coined the term “script-fading” to describe this intervention.

Even though functional communication training is generally considered effective, Mancil (2006) cautions that often these interventions are delivered by clinicians who leave the teaching environment after their studies have concluded. It may be difficult for teachers of those children who received treatments, to implement the intervention in the absence of researchers because the teachers may not have had the opportunity to practice with corrective feedback. Also, Mancil notes that many interventions are not carefully designed for generalization beyond a clinical setting.

Communication impairments in autism leave the individual without the skills necessary to engage in and maintain social interactions. Communication impairments can also be responsible for challenging behaviors born from an attempt to communicate a want, a need, or to engage with others socially. However, reductive strategies that do not consider communicative intent can further isolate an individual. Thus, efforts to develop functional communication training methodologies for children with autism are a critical component of autism intervention research. This study examines the efficacy of script
fading to teach young children with autism to reciprocate information to peers.

Exchanging information is a skill that can ease navigation of the environment and help build social relationships through interaction.

Purpose of the Study

In a review of treatment efficacy, Goldstein (2002) determined that script fading is a promising procedure to integrate communication interventions into the natural environment of children with autism. "A script is an audio taped or written word, phrase, or sentence that enables young people with autism to start or continue conversation" (McClannahan & Krantz, 2005, p. 5). Script fading is the process of presenting audio taped or written words, sentences, or phrases to participants and manually prompting them to speak or read aloud those words, sentences, or phrases in context. Once a predetermined level of responding is achieved and manual prompts have been faded, the written prompt is systematically faded in predetermined steps (Krantz & McClannahan, 1993; 1998; Sarokoff, Taylor, & Poulson, 2001).

Previous researchers studying script fading have taught a variety of communicative functions. Krantz, Zalenski, Hall, Fenske, & McClannahan (1981) used a rehearsal technique to teach subjects with autism to answer questions about events that had occurred in the past. Goldstein and Cisar (1992) also used a rehearsal technique to teach complex play sequences to children with autism. McGee, Krantz, and McClannahan (1984) used script training to teach both positive and negative verbal assertions. Krantz and McClannahan (1993) used written scripts to teach initiating to children with autism. Later, Krantz and McClannahan (1998) used written scripts to teach children with autism,
who had minimal reading skills, to engage in spontaneous social exchanges. Sarokoff, Taylor, and Poulson (2001) used script fading to teach children with autism to engage in conversational exchanges. Charlop-Christy and Kelso (2003) also used script fading to teach conversational speech to children with autism. This study has been designed to extend this body of literature through the examination of the effects of script fading on the ability of children with autism to reciprocate information to a peer about objects and pictures that are within their possession.

Research Questions

The specific research questions to be explored by this study are: (a) What are the effects of a script-fading procedure on scripted statements, unscripted statements, and non-responses used by children with autism to reciprocate information to a peer about an object that is in their possession? (b) What are the effects of a script-fading procedure on scripted statements, unscripted statements, and non-responses used by children with autism to reciprocate information to a peer about a picture that is in their possession? (c) Will children with autism who learn scripts to reciprocate information about an object that is within their possession use that learned reciprocal script to share information about a novel item? (d) Will children with autism who learn scripts to reciprocate information about a picture that is within their possession use that learned reciprocal script to share information about a novel picture?
Significance of the Study

Many of the most prominent studies on script fading have occurred in special programs or research institutes that have schools attached to them for research purposes (Charlop-Christy & Kelso, 2003; Goldstein & Cisar, 1992; Krantz & McClannahan 1993, 1998; Sarokoff, Taylor, & Poulson, 2001; and Stevenson, Krantz, & McClannahan, 2000). Replication of some of the fading procedures described in the literature such as video modeling (Charlop & Milstein, 1989), or procedures that require more than one adult to implement, such as the one reported by Loveland and Tunali (1991), may be better suited to clinical environments or model classrooms than to the average public school class for children with autism. This is unknown because results from studies in which children with autism are taught exactly what to say in particular circumstances that have been conducted in public school programs have only been reported in two studies (Gaylord-Ross, Haring, Breen, & Pitts-Conway, 1984; Ross, 2002).

Klinger, Ahwee, Pilonieta, and Mendez (2003) examined the barriers and facilitators in implementing research-based practices in education. Some of the barriers they found were lack of instructional time, too many competing demands, and lack of materials. Teaching language through script fading and during regularly scheduled classroom times will not be hindered by any of the previously enumerated barriers. The present script fading model can be administered by one adult, to two participants simultaneously, during three minute (or less) sessions. The materials necessary for the present script fading procedure are readily available or can be easily created in most classrooms with minimal expense or effort.
Some of the factors facilitating successful research to practice found by Klinger, et al. (2003) were that students liked the intervention, students did well as a result of the intervention, and administrators provided support. Teaching scripts lends itself to all three of these facilitating factors. For example, if training revolves around subjects that are preferred by the individual students or on topics that are immediately relevant to the student, training sessions may be enjoyable for the student. Also, because the procedure allows for direct instruction on how to read the script prior to engaging in script fading sessions, success is built into the training. Given that many people enjoy success, participants may feel a sense of accomplishment while participating in the intervention. Last, administrators will certainly support the use of research-based interventions in their school. Thus, a large part of the significance of the present study is the practicality of the script fading procedure described in this study for use in a public school setting.

This study is also significant because it seeks to help provide further evidence for the effectiveness of a promising intervention to mitigate one of the frustrating aspects of autism, language deficits. Determining effective interventions for autism expeditiously is of the essence in light of recent reports of climbing autism prevalence rates. "Approximately 1 in 150 children—representing various communities in the United States—have autism spectrum disorder, according to a Centers for Disease Control and Prevention working group" (Johns Hopkins Bloomberg School of Public Health, 2007, p. 1). Whereas, "For decades, autism was believed to occur in 4 to 5 per 10,000 children" (Centers for Disease Control and Prevention, 2007 p. 1). As the prevalence of autism increases the pressure to find viable interventions for general public use also increases.
Limitations of the Study

There are several notable limitations of the present study. First, the intervention is designed to be applied to children with autism that have an ability to communicate verbally and can receptively identify basic objects within the environment. The intervention relies on the participants’ ability to repeat phrases and sentences that are measured as the dependent variable. Thus, this ability is a prerequisite for this intervention.

This study also involves examination of the effects of a scripting procedure of elementary-aged school children with autism. Because children gain language skills more readily than adults do (Hulit & Howard, 2002) results of this investigation may be limited to the age group of the subjects examined in this study.

A further limitation is that, this study occurred in a public school setting and as such some variables were beyond the control of the investigator. Such factors included, but were not limited to, the abilities of enrolled students, previous relationships between students who were new to the program, students who were new to the program whose behavioral characteristics were unknown to the investigator, and interruptions during intervention sessions such as fire drills, announcements, phone calls, and other disruptions that occur in a classroom in a public school.

Summary

A defining characteristic of autism is delays in communication skills. A potentially promising intervention to teach verbal communication skills to children with autism is script fading. This procedure introduces a written script which is systematically
faded by removing words as the script is learned. Teaching children with autism communication skills using scripting techniques appears to be a viable and economical treatment to teach durable verbal communication skills to children with autism. Previous studies on script fading have involved teaching a variety of communicative functions to children with autism such as answering questions about past events, teaching verbal assertions, teaching initiating and other verbal communication skills. This study extends the body of literature on script fading by examining the effects of script fading on the ability of children with autism to reciprocate information to peers about objects and pictures that are within their possession. Another goal of this study was to examine the efficacy of script fading to produce verbal responding in children with autism who attend a public school program.

In the next chapter, a review of the literature provides an in depth overview of published research to determine the efficacy of script fading as a viable intervention to improve verbal communication performance of children with autism. Chapter three enumerates the research questions addressed herein, describes the method that was used to answer the research questions, and describes the subjects who participated in the study. Chapter four discusses the resulting data in relationship to each of the research questions posed by this study. Chapter five examines the conclusions drawn from each research question in terms of the results of previously published studies on script fading. Conclusions drawn from this study are also reported, as is the practical application of these findings. Chapter five concludes with suggestions for future research.
Definitions of Terms

*Autism* refers to a condition presented by an individual that has been identified as autism by a trained and licensed school psychologist. Because of varying identification procedures between states this educational diagnosis may not be equivalent to a clinical diagnosis made by a licensed psychologist or psychiatrist using standardized diagnostic criteria. Therefore, for the purpose of this study the term *child with autism* refers to a child that was somewhere on the autism spectrum from severe autism to pervasive developmental disorder not otherwise specified (American Psychological Association, 1994).

*Conversant* is a person engaged in a reciprocal verbal exchange with another person. For example, Bill and Bob are talking about last night’s game. They are both conversants.

*Dyads* are two students who are paired together to maintain a communicative relationship for the duration of the study.

*Generalization* is when the basic structure of a script is transferred to a novel object (e.g., “I have a duck” becomes, “I have a pig” when presented with a pig for the first, and subsequent times.) or picture (e.g., “I see a ball” becomes, “I see a kite” when presented with a novel picture depicting a kite).

*Novel Statements* are when participants used language from learned scripts with novel language to produce a grammatically correct and contextually appropriate novel statement; or if language from two scripts were combined to make a grammatically correct and contextually appropriate novel statement.
Referent is the object or picture that is the subject of the script. For example, the script reads, “I have a duck.” The referent would be a plastic toy duck.

Script Fading is the process of presenting to a student a written statement to read aloud in a context in which that statement will be meaningful. Once the student becomes familiar with the scripted statement(s), the written prompt is faded by systematically removing some of the words in predetermined steps from back to front terminating in the absence of any written prompt.

Scripted Statement: is a statement that those that matches the written script verbatim, with the exception that, conjunctions, articles, prepositions, or pronouns could be altered or deleted. Also, verb tense could be changed

Unscripted Statement is any contextually appropriate verbal production that differs from the script by more than, conjunctions, articles, prepositions, pronouns, or changes in verb tense.

Scripts are verbatim recitations of one or several spoken words that have been systematically taught to the participant for the purpose of recitation in a context in which that statement will have meaning. For example, Bill learns the script, “I have a duck” when he is holding a toy plastic duck.
CHAPTER 2

REVIEW OF RELATED LITERATURE

Introduction

The current literature review examines the published, original research on teaching children with autism scripted words and statements for communicative intent. This chapter discusses the search procedures used to identify potentially relevant articles and how those articles were filtered to identify the most relevant literature on script training procedures for children with autism. The chapter concludes with a brief summary of the reviewed literature.

Literature Review Procedures

An advanced electronic search of the following databases was conducted simultaneously through the EBSCO database service provided through the UNLV library’s electronic database subscription service: Academic Search Premier, Child Development & Adolescent Studies, CINAHL, Educational Resource Information Center (ERIC), PsycARTICLES, and PsycINFO. The following limiters were used: for Academic Search Premier, “Scholarly (Peer Reviewed) Journals,” for CINAHL, “Peer Reviewed,” for ERIC, “Peer Reviewed,” for PsycARTICLES, “Exclude Book Reviews,” for PsycINFO, “Peer Reviewed” and “Exclude Dissertations.” The following search terms were used: “autism” and “script.”
Selection Criteria

For the selection and exclusion of literature on scripting procedures a three-tier system was used. First, any article gleaned from the previously described search that had the word “script” in either the title or abstract was obtained. Second, a review of the reference lists of each of those articles was manually conducted. Third, any title that referred to communication training and autism was investigated with the following exclusions: (a) was not a text book chapter, (b) was not a literature review or theoretical perspective paper, (c) was not qualitative research or a case study, (d) was not a dissertation, (e) was not a paper that was presented at a meeting, (f) was not a peer intervention, (g) was not video modeling, (h) was not pivotal response training, (i) was not a self-management strategy, (j) the scripting procedure was not part of a treatment package, (k) if the script procedure was part of a training package it was measured separately. From this three-tier review 15 articles were identified for inclusion in the following literature review.

Verbal/Audio Script Training

Krantz, Zalenski, Hall, Fenske, & McClannahan (1981) reported on three experiments designed to determine the efficacy of three different approaches to teaching complex language skills to children with autism. The third of these three experiments examined the effects of a verbal rehearsal procedure on the ability of children with autism to answer questions about past events, while speaking in two or more sentences; what the authors refer to as “paragraphic speech” (p. 285).
Participants were two children with autism. The first subject was a 5-year-old boy with autism whose mental age, as measured by the Peabody Picture Vocabulary Test administered eight months prior to the commencement of the study, was 2.2. The same subject scored a vocabulary age equivalent of 3.0 on the Assessment of Children’s Language Comprehension five months prior to commencement of the study. The other subject was a 5-year-old girl with autism who did not score on the Peabody Picture Vocabulary Test. Two months prior to the commencement of the study she scored under 3.0 years on the Assessment of Children’s Language Comprehension test (Krantz et al., 1981).

The study used a multiple baseline across behaviors to measure correct responding to questions about past events. Teachers wrote questions about each subjects’ activities during the day and sent them home in the subjects’ lunchbox. The subjects’ parents then asked the questions and scored the response. An example of a question sent home by teachers was, “Who met you at the bus” (p. 286)? Likewise, the subjects’ parent wrote questions about events at home that were asked in school and scored. An example of a question was, “What did you do outside with your brothers” (p. 287)? Responses being measured were correct usage of words at home, correct usage of words at school, correct usage of paragraphs at home, and correct usage of paragraphs at school (Krantz et al., 1981).

During baseline, for sentence and paragraph usage at home, the cooperating parent asked the subjects a series of five questions prepared by the teacher while seated three feet across from the subject. The subjects’ responses were recorded verbatim if the response occurred within three seconds of the questions being asked. If responses were
incorrect during baseline a correction procedure was used. Similarly, during baseline, for sentence and paragraph usage at school, teachers asked subjects five questions prepared by parents and scored in similar fashion. The classroom teachers also used a correction procedure for incorrect responses during baseline. Data collection began earlier for teachers than for parents so that parents could become vested in the intervention before increasing their responsibility to it (Krantz et al., 1981).

Training consisted of ten minute rehearsal sessions occurring during the subjects’ regularly scheduled daily one to one training. Home training was conducted by parents. For the male subject home training occurred in the morning before school and for the female subject training occurred in the evening just before bedtime. During rehearsals subjects were explicitly told what to say in response to the questions being asked. Each rehearsal session continued until the subject could correctly answer the prepared questions unprompted within three seconds of being asked. A no rehearsal phase was instituted for the female subject. During this phase the subject was asked questions about recent events but did not receive rehearsal training. Interobserver agreement data were collected for five days of each phase for each subject. Interobserver agreement for the male subject was 100% during baseline and 97% during rehearsals. Interobserver agreement for the female subject was 100% during baseline, 97% during rehearsals, and 80% during no rehearsals (Krantz et al., 1981).

The male subject only answered one question correctly during baseline. He started by rehearsing two questions at school to be answered at home and moved to five questions in fewer than two weeks. When training began for paragraphs to be used at home the subject correctly answered five questions after five days and averaged four out
of five correct responses for the balance of the study. After 13 days of training, this subject averaged two correct paragraph responses in school per day. At the end of the rehearsal phase for the female subject, she was correctly answering four to five questions per day in full sentences. After only six school rehearsal sessions she was able to answer all five school related questions at home using full sentences. Home rehearsals for questions asked in school also had a positive impact demonstrated by the subjects’ ability to answer four of five questions in school about events at home in full sentences and three in paragraphs (Krantz et al., 1981).

Results demonstrated the effectiveness of teaching children with autism verbatim responses to questions about past events in increasing appropriate verbal behavior in context. Krantz, et. al. (1981) also adds that the intervention described is easily adaptable for use with students that have severe language delays. They also observed that although some of the responses were accurate they were not the rehearsed answers the students learned. Thus, they concluded that the intervention facilitated generative speech. Krantz, et. al. (1981) recognized that the time difference between the event, the rehearsal, and the asking and answering of related questions at home and at school were different and may have been a potential confounding variable. They suggest that future research should address differences in immediate, versus delayed, rehearsals and the posing of standard, versus, varied questions.

Gaylord-Ross, Haring, Breen, and Pitts-Conway (1984) examined social skill development between adolescent children with and without autism in a general education high school setting in a series of two studies published under one title. The first study reported had two subjects. Both subjects were males who had received diagnoses of
autism from outside agencies. The first subject, Mike, was a 20-year-old student who engaged in high levels of inappropriate, stereotyped behaviors. He had a verbal vocabulary of about 100 words and could request food and the bathroom. He responded to social greetings but did not initiate. His IQ was reported to be between 35 and 45. The other subject, Dan, was a 17 year-old and exhibited acting-out behaviors such as hand-biting, hitting people, and breaking objects. Dan was able to engage in many independent activities such as riding a public bus by himself. Dan would respond to greetings but did not initiate; sometimes he initiated physical contact with staff, “...by tickling them, scratching their backs, or touching their hands” (p. 231).

A multiple baseline design with probes was used across three stimuli to measure the effectiveness of a social skills intervention package on subjects’ ability to approach a prospective conversant, initiate, engage in exchange, and terminate the interaction. Correct responses were tallied and reduced to a percentage (Gaylord-Ross, et al., 1984).

Subjects attended a classroom that was attached to three other classrooms via a common courtyard. Generally there were 35 typically developing high-school-age children and 8 children with special needs. Training was delivered equally in both the special education classroom and in the generalization setting when other students were not present. Subjects were exposed to five conditions: (a) no-object baseline, (b) object-only condition, (c) object function training, (d) social skill training, and (e) maintenance (Gaylord-Ross, et al., 1984).

During no-object baseline, students milled about the courtyard with other students; subjects had no objects. During object only conditions, subjects milled about the courtyard with their peers holding one of three objects of interest. During the object
condition, the correct operation of each object was task analyzed and taught to the subject. Social skill training consisted of teaching the subject to initiate, engage, and terminate a conversation. A script including actions and words was created which was taught to subjects in two, 5 minute sessions per day consisting of six trials per session, held 15 minutes before generalization probes. Scripts were rehearsed with typical confederates. Trainers facilitated social interactions between subjects and peers during this training stage; multiple peer exemplars were used. Maintenance occurred four months after the cessation of training; subjects received no instruction during maintenance (Gaylord-Ross, et al., 1984).

Interobserver agreement data were collected for 34% of the generalization probes with Mike and 39% of the generalization probes with Dan. Interobserver agreement data were collected on frequency of interaction during generalization (93% for Dan and 97% for Mike), duration of interaction during generalization (Dan 94% and Mike 84%), and during behavioral steps training (100% for both subjects) (Gaylord-Ross, et al., 1984).

Results demonstrated that the social skills training had a strong impact on performance across all three objects with both subjects. Dan increased social initiation from one correct response in 16 sessions to 16 responses in 17 sessions. Whereas, Mike demonstrated generalization of learned initiation skills in the absence of the training objects. Both subjects increased the duration of interactions after the social skills training. Gaylord-Ross, et. al. (1984) also found that Mike was approached by typical peers twice as often after he received social skills training. Likewise Dan was eight times more likely to be approached in the last phase than he was in the initial phase. During maintenance, Dan initiated twice and Mike did not initiate at all.
Gaylord-Ross, et. al. (1984) concluded that the social skills training package that included teaching students how to use objects and offer them to peers was effective. Further, they also claim to have demonstrated the effectiveness of using multiple exemplars to increase generalization. Subjects learned to interact with typical peers for one to three interactions per 15 minute session. They also concluded that subjects with autism were seen as more pleasing to interact with after the intervention was administered. They also recognized that the experimental design might have inhibited the development of generalization because the object-only phase occurred just prior to the social skills training phase.

Their second experiment replicated the first experiment with one subject. This study altered the baseline procedures to control for the confound of repeated baseline measures. Also, the object training phase was combined with the social skills training phase. This subject increased from 10%-20% correct responding in baseline to 90%-100% during the training condition, and demonstrated one initiation during maintenance lasting 46 seconds (Gaylord-Ross, et al., 1984).

McGee, Krantz, and McClannahan, (1984) conducted an experiment designed to determine the effectiveness of a procedure for teaching children with autism both positive and negative verbal assertions during naturally occurring recreational activities. They also examined generalization and maintenance of learned skills. Three children with autism participated in the study.

All three subjects were adolescent males attending a specialized treatment program for children with autism. Each subject had received a diagnosis of autism by at
least two independent agencies. All three subjects were able to follow directions and had functional expressive language skills (McGee, et al., 1984).

In this study, the rules of a simple card game and a simple ball game were taught to the subjects over four sessions. Then, during joint training sessions held just before the scheduled games, the instructor modeled specific verbal responses to circumstances that would arise during the course of the two games such as: “Great play,” “I like playing with you,” “Isn’t this fun,” and “It’s my turn now” (McGee, et al., 1984, p. 323). The instructor also explained when taught statements would be appropriate. Last, the instructor prompted and praised target responses. Thus, the intervention package consisted of modeling, rehearsal, and contingent reinforcement for appropriate responses (McGee, et al.).

A multiple baseline across behaviors was used to measure two types of assertions across two sets of circumstances. Specifically, data were collected on both taught and novel positive and negative assertions made during a card game and during a ball game. Interobserver agreement data were collected for 34% of the sessions. Interobserver agreement for subject one was reported as 92%, 92% for subject two, and 94% for subject three (McGee, et al., 1984).

The average percent of intervals for demonstration of assertive statements increased for subject one from 1% during baseline to 36% during the teaching phase. The average percent of intervals for demonstration of assertive statements increased for subject two from 2.25% during baseline to 28.75% during the teaching phase. The average percent of intervals for demonstration of assertive statements increased for
subject three from 4% during baseline to 37% during the teaching phase (McGee, et al., 1984).

During follow-up measurements 4.5 months after the conclusion of instruction, subject one made positive assertions during 33% of intervals in card games and 46% in ball games. Subject two made positive assertions during 21% of intervals in card games and 29% in ball games. Subject three made positive assertions during 71% of intervals in card games and 96% in ball games. Subject one made negative assertions during 29% of intervals in card games and 75% in ball game. Subject two made negative assertions during 0% of intervals in card games and 46% in ball games. Subject three made negative assertions during 29% of intervals in card games and 54% in ball games. Generalization occurred after skills were directly taught across response classes (McGee, et al., 1984).

McGee, et al., (1984) concluded that appropriate assertive responding can be taught to students with autism. They suggested that this process was facilitated by teaching target skills in natural environments where they would be used. They also found that only trained negative assertions were demonstrated at the 4.5 month follow-up. McGee et al., concluded that this is the result of teachers and parents praising the use of positive statements while ignoring negative statements.

McGee et al. (1984), suggested that future research should investigate procedures for teaching students to discriminate when positive and negative assertions should be used. They do not note any potential limitations to their study.

Coe, Matson, Fee, Manikam, and Linarello, (1990) examined the effects of social skills training on the play context of young children with disabilities. Their intention was to extend the research base on social skills training for children with disabilities by
training nonverbal and verbal responses. Also, by repeatedly practicing skills in brief play sessions and by teaching subjects to play a game and later adding verbal responses.

Subjects were described as two boys with autism functioning in the range of mental retardation and one girl with Down syndrome. John was 6 years old, Mary was 5 years old, and Fred was 6 years old at the time of the study. Both boys had severe delays in language and Mary had difficulty starting and maintaining interactions with peers (Coe et al. 1990).

A multiple baseline across behaviors was used to measure: (a) contact with the ball, (b) initiation, (c) cooperation, and (d) giving compliments. Instruction for the first three target behaviors occurred simultaneously during the first phase and complimenting was addressed in the second phase. Raters observed and recorded target behaviors, “...for 10-second intervals every 40 seconds – a total of 15 intervals for each session of 10 minutes” (p.180). The training was conducted three to four days per week in a classroom with no desks and a one-way mirror for observations. During baseline, present in the room were the subject, an adult trainer, a confederate adult, and a peer with disabilities. The subject was given toys and told that the adults only wanted to watch as they played (Coe et al. 1990).

Training consisted of food reinforcement, verbal praise, and a prompt hierarchy. The prompt hierarchy was nonverbal prompt, verbal prompt, partial verbal prompt for targeted verbal responses, full verbal prompt for targeted verbal responses, and full physical prompt. In this way subjects were first taught to touch and pick up the ball. Then, they were taught to say, “Play ball [insert partner’s name].” Next, the subjects were taught to pass the ball back and forth for five exchanges. Last, subjects were taught to
say, "Good [insert partner’s name]" each time after they caught the ball. Time-out for 15 to 60 seconds was administered for displays of aggressive and noncompliant behaviors (Coe et al. 1990).

Interobserver data were collected for 51% of intervals that were rated. These data were reduced to proportions of agreement. The average proportion of agreement for all four observed behaviors was .96. John’s results demonstrated wide variation in responding for the first three target skills. However, he acquired complimenting with less difficulty and in less time. Mary’s results indicated that she acquired skills more readily than John but never reached the same levels of performance. Last, Fred’s results indicated he was able to begin playing with the ball very quickly after intervention began. However, initiation and cooperation were more difficult for him; he never reached the levels of the two other subjects. Complimenting and cooperative play responding was more inconsistent for Fred than for the other two subjects (Coe et al. 1990).

Coe et al. (1990) noted that all three subjects learned the targeted skills to some degree. They also noted that the addition of the compliment requirement did not have a negative impact on the performance of the other target skills. They also explained that because responding levels were low in their study that the type of insensitive instruction described in this study might be more efficient than training in natural environments. They speculated this because in a natural environment opportunities to practice would be minimal, whereas in their study opportunities to practice were abundant.

Coe et al. (1990) recognized that their study was limited by time constraints. They were unable to extend the length of the play session to more natural durations. Also, they were unable to fade the food and verbal reinforcement. They suggest that future
researchers might address how to introduce new responses to continuing behavior sequences and how verbal and nonverbal behaviors can complement one another within these contexts.

Loveland and Tunali (1991) examined differences in the abilities of people with autism and people with Down syndrome to appropriately respond to expressions of distress. They also examined the effect of a modeling procedure on the subjects' levels of responding.

Participants included 13 people with autism and 13 people with Down syndrome ranging in age from 5 to 27 years old. Each subject with autism had been diagnosed based on DSM III-R criteria by a developmental pediatrician specializing in autism and pervasive developmental disorders. The Leiter International Performance Scale was administered to each participant to determine nonverbal age equivalents before the commencement of the study. Verbal age equivalents were determined by administering the McCarthy Scales of Children's Abilities-Verbal Scale and the Peabody Picture Vocabulary Test (Loveland & Tunali, 1991).

Triads, consisting of two examiners and one subject, sat together under the guise of sharing drinks and snacks referred to as a “tea party” (Loveland & Tunali, 1991, p. 180). One of the examiners told the subject a fabricated story about an unfortunate event, e.g., “sick pet, stolen wallet” (Loveland & Tunali, 1991, p. 180) that would normally elicit a sympathetic response or helpful suggestion. If subjects did not respond appropriately the other examiner modeled an appropriate response.

Responses were reduced to numerical values that were combined and subjected to t tests. Dimensions of coding included, unintelligible and irrelevant responses, comments
on the tea party, marginally relevant responses, concretely relevant responses, and relevant responses that included a sympathetic remark. Interobserver agreement data were collected for 25% of the subjects and reported reliability was 0.90 (Loveland & Tunali, 1991).

Results from a $t$ test indicated that the only differences between the groups on the pretest measures were that the group with autism had higher nonverbal age equivalent scores on The Leiter International Performance Scale. Because the group with autism had all males and the Down syndrome groups had six females and seven males, $t$ tests were performed to compare these females and males on the pretest measures. No significant results were found. Subjects with autism made significantly more comments about the tea party only according to $t$ tests conducted on target behaviors. Subjects with Down syndrome made significantly more tangible suggestions and they made significantly more sympathetic remarks. Among those subjects with Down syndrome that required modeling, 86% demonstrated improvement whereas only 42% of the subjects with autism demonstrated improvements after modeling (Loveland & Tunali, 1991).

Loveland and Tunali (1991) concluded that results demonstrated that people within these two disability groups differ in their ability to respond appropriately to expressions of misfortune of others. They also suggested that their findings demonstrated that modeling can be an effective strategy to teach persons with autism socially appropriate responding. They noted that correct responses from subjects with autism often did not merely echo the words of the exemplar verbatim; subjects produced novel statements.
Loveland and Tunali (1991) recognized that the results of their study may have been limited by the affective content of the discriminative stimulus that had been simultaneously presented within a context with differing content. Because of this, it is difficult to determine which aspects of the interaction presented the most difficulty for subjects with autism. They suggested that future research should focus on the responses of people with autism to social content that is not affective and not interpersonal in nature.

Goldstein and Cisar (1992) conducted a study to determine the effects of teaching sociodramatic scripts with controlled differences in teacher prompting to preschoolers across a variety of conditions. Subjects were nine children who attended an integrated preschool program. Three triads were formed each consisting of one child with autism and two typically developing peers. Typical peers ranged in age from 3 years 7 months to 5 years; and scored at or above their age level on both the McCarthy Scales of Children's Abilities and the Learning Accomplishment Profile – Diagnostic Edition.

Among the three subjects with disabilities Curt and Don scored in the mild to moderate range for likelihood of autism on the Childhood Autism Rating Scale, Max was no longer scoring in the autistic range at the outset of this study. Max’s overall cognitive index on the McCarthy Scales was 118, however, he continued to make irrelevant statements and engage in noncompliant behavior. Max displayed no language delays. Curt and Don both received a score of 46 on the McCarthy Scales and demonstrated language delays. Their language skills were assessed using the Sequenced inventory of Communication Development. Don’s receptive language score was 28 months and his expressive language score was 32 months. Curt’s receptive language score was 32
months and his expressive language score was 28 months. It was reported that both Don and Curt often exhibited echolalic responses (Goldstein & Cisar, 1992).

Script training occurred in an unused classroom at the preschool. The subjects’ teachers did not observe training sessions. Training sessions lasted 15 minutes per day. Each triad learned one of three sociodramatic scripts in turn; and each subject learned each role within the script. Scenarios included a pet shop, magic show, and carnival; relevant materials were provided. Each scenario was designed to have 10 interactions that included one of the following responses: (a) nonverbal, (b) minimum verbal, (c) elaborated verbal, or (d) a combination of nonverbal and verbal (Goldstein & Cisar, 1992).

During training, the subjects were each assigned a role, given an overview, and led through the script using a least to most prompting hierarchy. Subjects were told what to do and what to say. Training ceased when subjects responded with 80% accuracy or after 10 training sessions had been finished; Max’s group required 15 training sessions. A token economy was introduced across all groups; rewards were earned for 50% correct responding. Trainers reviewed scripts with the subjects’ classroom teachers. During free-play teachers monitored the subjects only prompting or praising every 20 seconds, and later every 25 seconds. Subjects’ behavior was coded as correct, related to scenario, unrelated to scenario, and nonsocial verbalization. Teacher behavior was coded as giving general prompts, specific prompts, physical prompts, and praise. Interobserver agreement during training for 60 of 144 sessions was 86%. Interobserver agreement for target subject target behavior during free-play for 50 of 202 sessions was 88% (Goldstein & Cisar, 1992).
A multiple baseline with three phases across scripts was used to measure the effects of script training on subject interaction during play. Phases of the experiment were baseline, post-training, and generalization. During baseline, subjects were assigned their roles and given materials and instructions to play; no other instruction was given. Post-training was the same as baseline except it occurred after subjects had learned their scripts; teachers intervened every 20 seconds and later every 25 seconds. During generalization, the triads were rearranged (Goldstein & Cisar, 1992).

None of the groups achieved the target 80% criterion for the first script; however all groups learned the second and third scripts to 80% criterion. All subjects demonstrated improvement in relevant behaviors; these improvements became greater as more scripts were learned. During the generalization phase, all subjects exhibited greater levels of social interactions and lower levels of off-task behavior. Also, untrained, relevant behaviors increased. All subjects increased appropriate verbal interactions (Goldstein & Cisar, 1992).

Goldstein and Cisar (1992) found that when the script training was introduced all subjects improved their social communications skills; these effects were replicated across three scenarios. Also, the frequency of social communication among the subjects increased. Subjects also elaborated on their roles to produce novel relevant behaviors. Both Don and Curt increased social behavior to levels that equaled their non-disabled peers. Goldstein and Cisar noted that any future attempts to replicate this procedure might systematically reduce the rate of prompting as more scripts are learned. They also noted that because teachers praised subjects’ appropriate behavior, they cannot be certain whether or not that praise played a role in the increases noted.
Stevenson, Krantz, and McClannahan (2000) investigated the efficacy of a systematically faded audio taped script training procedure on conversational skills of young children with autism who could not read. Subjects were four boys that met the criteria for autism and attended an intervention day school program for children with special needs for five and one half hours per day five times per week.

The first subject, Rick, was age 12 and had a Peabody Picture Vocabulary Test age equivalent of 6-9 and a Vineland Adaptive Behavior Scales age equivalent of 4-8. The second subject, Mike, was age 15 and had a Peabody Picture Vocabulary Test age equivalent of 5-0 and a Vineland Adaptive Behavior Scales age equivalent of 5-0. The third subject, Brett, was age 13 and had a Peabody Picture Vocabulary Test age equivalent of 6-2 and a Vineland Adaptive Behavior Scales age equivalent of 4-0. The fourth subject, John, was age 10 and had a Peabody Picture Vocabulary Test age equivalent of 2-7 and a Vineland Adaptive Behavior Scales age equivalent of 3-2. All four subjects had some expressive language and had learned to mand, greet, and use courteous words. All subjects had learned to follow picture schedules and imitate audio taped scripts prior to the study (Stevenson et al., 2000).

Stevenson, et al. (2000) selected 25 independent activities such as worksheets and five social activities. Each activity was represented by a picture that was displayed on a board; social activities were represented by pictures of Language Master cards. A Language Master is a small device that records on and plays a small strip of audio tape affixed to a paper card. These 30 pictures were randomly divided into groups of five and rotated as a picture schedule for the subjects; the order of the scripts was also rotated across sessions. The dependent variables were identified as follows: Scripted interaction
one were responses that closely resembled the audio taped prompts with the exception that omissions and changes to conjunctions, articles, prepositions, pronouns, and verb tense were allowed. Scripted interaction two were responses that resembled an audio taped cue heard earlier, but was not the most recently played. Unscripted interactions were similar to but substantially different than the audio taped cue (i.e., “I like to eat pizza” became “I like to eat spaghetti” Stevenson et al., p. 6). Non-interactions were echolalic or single word responses.

A multiple probe design across participants with two baseline phases was used to measure the number of interactions using a continuous event-recording system. During the first baseline phase a familiar teacher available to receive conversation sat in one corner of the room. Observers sat in the opposite corner and the instructor stood in a corner on the opposite side of the room. Subjects were given materials for five non-social tasks and allowed to play for 10 minutes. Baseline two was identical to baseline one except that activity schedules were made available (Stevenson et al., 2000).

During the teaching phase, subjects were physically guided from behind with no verbal cues and using a hierarchy of most to least prompts to select their own activities from the board and place them in their schedules. Subjects were guided to approach the communicative recipient, and play a language master card. If the subject did not repeat the statement recorded on the card, he or she was prompted to play the card again. The communicative recipient responded to scripted statements by elaborating on what was said, taking caution not to ask questions or deliver instructions. After about four exchanges the communicative recipient ended the conversation. Once subjects repeated all scripts three times consecutively the script prompts were faded by removing the last
Simultaneously, a portion of the picture on the language master card was cut-off. This continued until only five nonsocial activities remained; as in baseline. Maintenance was conducted after three consecutive sessions of correct responding with no prompts (Stevenson et al., 2000).

Interobserver agreement data were collected on 60% of sessions. Interobserver agreement on verbatim recording of scripted interactions one was 100%, scripted interactions two was 98%, unscripted interactions was 91%, and non-interactions was 80%. All subjects met performance criterion for repeating scripted statements in five to nine sessions. During maintenance, unscripted interactions were still exhibited frequently by all the subjects (Stevenson et al., 2000).

Stevenson et al. (2000) concluded by noting that all participants said 15 or more unscripted statements each during sessions after scripts were completely faded and during maintenance. Subjects often produced novel statements based on learned scripts. For example, “I like Pizza,” became “I like to roller-skate” (p. 16). They also noted that subjects repeated the statements made by the communicative recipient and used them appropriately in other contexts. Similarly, subjects learned statements used to end conversations and used them appropriately. Stevenson et al. state that this may have been a drawback in their design. They proposed waiting to teach closing statements until more scripts are learned because subjects used them to end conversations early. They also proposed that future researchers should examine generalization of interaction skills across settings, communicative recipients, and various scripts.

MacDuff, Ledo, McClannahan, and Krantz (2007) wanted to determine the effects of script fading on joint attention skills in children with autism. Specifically, scripts were
used to teach children with autism to initiate bids for joint attention defined as, orienting
toward an adult, pointing to an object, and saying, “See.” Participants were three boys
with a diagnosis of autism ages three, four, and five. The first participant was a four year
old boy with no expressive language skills and tantrum behavior. Prior to the study he
scored an age equivalent “…of 1.9 on the Preschool Language Scale, and 1.5 on the
Vineland Adaptive Composite Scales (p. 283).” The second participant was a three year
old boy who had poor receptive language skills, and tantrum and self injurious behaviors.
His age equivalent score on both the Preschool Language Scale and the Vineland
Adaptive Composite Scales were 1.5. The third participant was a five year old boy who
had no speech, and displayed stereotypic and tantrum behaviors. His age equivalent score
on the Preschool Language Scale was 1.9 and was 1.10 on the Vineland Adaptive
Composite Scales.

In a pre-teaching phase participants were taught to say some one syllable words
including the word “see,” which was the script for this study. Participants were also
taught to point with their index fingers. During intervention, an instructor would walk
down a hallway with a participant. The hallway had 12 two and three dimensional items
of interest to young children displayed within view of the participants. Each object had a
button activated recording device that would play back the script, “See.” Manual
guidance and food reinforcement was used to teach participants to press the button, orient
toward the instructor and say, “See.” Scripts were faded in two steps when participants
correctly responded 11 times when given 12 opportunities. The first fading step was the
erasure of the recording on the device. The second fading step was the removal of the
recording device altogether. However, in the instance of one participant blank recorders
had to be left on objects and rotated among the various stimuli that served as conversational referents longer due to a drop in performance during their absence. The study also included both a generalization and a maintenance phase. The generalization phase was conducted in a new environment with new objects, and the maintenance phase duplicated the baseline phase in the hallway where teaching took place.

A multiple probe across participants design was used. Both scripted and unscripted verbal bids for attention were measured along with pointing behaviors. Pointing behaviors and unscripted statements were measured using a continuous event recording system. Scripted bids for joint attention were measured with a per opportunity measure. Interobserver agreement measures were taken from 80% of baseline and generalization sessions, 36% of the intervention sessions, and from 40% of maintenance sessions. Interobserver agreement for scripted, unscripted, and pointing was all reported to be over 93%.

MacDuff, et al. (2007) reported that the number of unscripted bids for joint attention made by participants during teaching was almost exactly the same during the maintenance phase. Also, during generalization probes (in both teaching and maintenance phases) participants did generalize learned skills to untrained objects in a new environment. They also noted that pointing behaviors decreased with the removal of the recording devices. MacDuff suggests the recording device requires a person to extend their finger to operate the device and in its absence pointing is no longer required. During generalization, one subject's pointing went unchanged. However, another participant showed a marked decrease in pointing and the third did not carry the skill over at all.
MacDuff, et al. (2007) concluded that their two step recorded script fading procedure was successful in teaching all three participants to initiate bids for joint attention by both pointing to an object and verbalizing, “see.” They noted that unscripted bids for joint attention usually included the object’s label with the word see. It is for this reason that they felt that future researchers might consider whether or not an instructor’s use of language influences the use of language by the participant.

Summary of Research Related to Auditory Prompted Script Training

In 1981 Krantz et al. reported on a procedure that was used to teach children with autism to answer questions about temporally remote events. This procedure used rehearsal to teach the participants to correctly answer questions at school about events that had occurred at home, and vice versa. This study initiated an interest in teaching language skills to children with autism by directly instructing them in what should be said in a particular context. This general idea has evolved into a procedure now known as script fading.

Other studies have followed suit and like Krantz, et al. (1981) have used some form of rehearsal procedure to teach verbal communication skills to children with autism (McGee et al. 1984; Goldstein & Cisar, 1992). Other researchers have investigated teaching children with autism verbal communication skills using modeling (Loveland & Tunali, 1991, McGee et al., 1984) and the presentation of audio taped scripts associated with stimuli specific to the purpose of the script being taught (Stevenson et al., 2000; MacDuff et al., 2007).
Communication through verbal language can have many purposes. However, verbal communication cannot occur unless an initial contact is made. It is likely that this is the reason why many of the studies that used auditory prompts to teach verbal responding to children with autism have focused on teaching initiation, along with other skills, designed to increase the length and relevancy of conversations that participants engaged in after training (Coe et al., 1990; Gaylord-Ross et al., 1984; Goldstein & Cisar, 1992; Stevenson et al., 2000). Thus, in many instances researchers that have reported on treatment packages and interventions that were designed to teach children with autism contextually appropriate language skills, have been embedded within or associated with, a trained activity (Coe et al., 1990; Gaylord-Ross et al., Goldstein & Cisar, 1992; 1984; MacDuff et al., 2007; McGee et al., 1984).

Teaching children with autism appropriate verbal responding has targeted both subject to peer communications (Gaylord-Ross, et al., 1984; Goldstein & Cisar, 1992; McGee, et al., 1984) and subject to adult communications (Coe et al., Krantz et al., 1981; 1990; Loveland & Tunali, 1991; MacDuff et al., 2007; Stevenson, et al., 2000). It is noteworthy that all of the subject to peer studies reviewed here has included an embedded activity. It is also noteworthy that three of the reviewed studies (Krantz et al., 1981; MacDuff et al., 2007; Stevenson et al., 2000) reported that participants made contextually appropriate unscripted statements and elaborations of scripts taught; all three of these studies were conducted at Princeton Child Development Institute.
Written Prompt Script Training

Krantz, and McClannahan (1993) investigated the effects of a written script training procedure with systematic fading on initiations made to peers by children with autism. Scripts were based on past, present, and future activities in close temporal proximity to training conditions. They also evaluated unscripted initiations, responses, generalization across settings, and maintenance.

Subjects were four children with autism. The first subject, Kate, was 12 years old. She had a Peabody Picture Vocabulary Test-R receptive language age equivalent of 5.1. On the Woodcock Reading Mastery Test Kate scored a 1.9 grade, she scored under 50 on the McCarthy Scales of Children’s Abilities, and had an age equivalent score of 5.2 on the Vineland Adaptive Behavior Scales. The second subject, Mike, was 12 years old. He had a Peabody Picture Vocabulary Test-R receptive language age equivalent of 4.5. On the Woodcock Reading Mastery Test Mike scored a 1.8 grade, he scored under 50 on the McCarthy Scales of Children’s Abilities, and had an age equivalent score of 5.1 on the Vineland Adaptive Behavior Scales. The third subject, Walt, was 12 years old. He had a Peabody Picture Vocabulary Test-R receptive language age equivalent of 4.9. On the Woodcock Reading Mastery Test Walt scored a 1.5 grade and had an age equivalent score of 5.2 on the Vineland Adaptive Behavior Scales. The fourth subject, Ross, was 9 years old. He had a Peabody Picture Vocabulary Test-R receptive language age equivalent of 4.4. On the Woodcock Reading Mastery Test Mike scored a 1.6 grade, he scored under 50 on the McCarthy Scales of Children’s Abilities, and had an age equivalent score of 4.6 on the Vineland Adaptive Behavior Scales (Krantz & McClannahan, 1993).
The study was conducted at a school and research center for children with autism. Training occurred in a classroom and generalization occurred in a conference room. Prior to the study, all subjects had learned to follow fairly sophisticated picture activity schedules and written activity schedules. All subjects had also acquired some functional expressive language skills, and all subjects were taught to read the words that made up the taught scripts. Krantz and McClannahan (1993) identified four dependent variables. Initiation to peers was a novel unprompted statement directed at a peer; repetitive responses were not scored. Scripted initiations were closely aligned with target scripts yet conjunctions, articles, prepositions, and pronouns could be changed or absent; verb tense could have been modified. Unscripted initiations were novel initiations, and a response was a reciprocation occurring within 5 seconds.

Training occurred just after a recess period within a group discussion about the class’ special weekly activity on Fridays. A multiple baseline across subjects design was used. During baseline, subjects engaged in drawing, coloring, or painting rotated across sessions. Subjects received written instructions, “Do your art” and “Talk a lot” (Krantz and McClannahan, 1993, p. 124). During training each subject was also presented with a paper containing 10 written scripts that included three other subjects’ names embedded in the script. The instructor manually guided the subjects to point to the written statement with a pencil; no verbal prompts were used. Once the subject read the statement they were manually guided to place a check mark next to the statement. Once prompts were faded scripts were faded in five steps finally being reduced to an open quotation mark (i.e., “). Generalization sessions occurred in a conference room with novel materials and
a novel teacher during sessions 34 through 39. A follow-up measurement was taken after two months.

Interobserver agreement data were collected on 80% of the classroom sessions and on five of the six generalization sessions. For Kate agreement on peer initiation was 100%, scripted initiations, 75%, and unscripted initiations 88%. For Mike agreement on peer initiation was 94%, scripted initiations, 100%, and unscripted initiations 90%. For Walt agreement on peer initiation was 100%, scripted initiations, 100%, and unscripted initiations 100%. For Ross agreement on peer initiation was 100%, scripted initiations, 100%, and unscripted initiations 100% Scales (Krantz & McClannahan, 1993).

Results indicated that all students increased the amount of initiations they emitted from 0-2 in baseline to 13-17 during training. After two months, all but one subject continued at this rate with the quotation mark prompts. In addition, it was noted that when the number of unscripted initiations increased, scripted initiations decreased among Kate, Mike, and Walt (Krantz & McClannahan, 1993).

In summarizing, Krantz and McClannahan (1993) noted that even though 10 scripts were targeted most subjects made more than 10 initiations in each session. They also noted that subjects' prior experience with written activity schedules may have facilitated the learning process. They reported that some unscripted initiations were completely novel statements; and that after session 37 Kate only made unscripted statements. They also noted the durability of the results; subjects still scored high after a summer vacation. Krantz and McClannahan suggested that future research should determine if longer more complex interactions can be trained by script-fading, if multiple scripts can encourage variety, ease of generalizability, and fading the prompt entirely.
In an extension of the previous research Krantz and McClannahan (1998) examined the effects of a script-fading procedure on children with autism who had minimal reading abilities. Subjects were three young boys diagnosed with autism pursuant to criteria specified in the DSM III. David, age 5, scored 62 on the Stanford-Binnet Intelligence Scale (4th ed.); Jeremiah, age 4, scored 42; and Ben, age 4, scored 36. All subjects had some expressive language yet did not initiate. Prior to the commencement of the investigation subjects were taught to follow five activity picture schedules. Subjects were also taught to read, “Look” and “Watch me” (Krantz & McClannahan, 1998, p. 193). One to two training sessions took place per day in a classroom environment. An intended communicative recipient sat in a corner of the room and a picture schedule was placed on a desk.

Krantz & McClannahan (1998) identified four dependent variables. Interaction was defined as an independent and understandable word or words directed at the target recipient. Scripted interaction was the participant saying, “look,” or “Watch me” in context. Elaborations were words spoken after the scripted word or statement was spoken by the subject. If a subject said novel words or repeated scripts in their absence it was coded as an unscripted initiation.

A multiple baseline across subjects design was used to evaluate the effects of the script-fading procedure on the number of initiations emitted by the subjects. Responses were coded using a continuous event-recording system. During baseline, instructors used gradual guidance from full physical to shadow prompting until subjects could perform the entire schedule with no prompts. During the training phase, when subjects turned to pages in their picture schedules that were combined with a script card the instructor
prompted the subject from behind to point to and read their script. Verbal prompts were used as necessary. The script “Watch me” was always located above a depicted activity indicating that the subject should approach the recipient before completing the task. Whereas, “Look” was always located under a depicted task indicating that the task should be completed before the subject approached the intended recipient. For Ben a velcro wrist band allowed him to bring the written prompt to the intended recipient for sessions 55 through 66. After the training phase, a novel recipient phase was implemented (Krantz & McClannahan, 1998).

Script-fading occurred after the introduction of a new communicative recipient was introduced. Scripts were faded in three steps by removing one third of the cue card at a time. No prompts were used during fading. In the last phase new activities were introduced. In this phase activities were introduced to the picture schedules that had not been previously associated with the scripts. For example, a witch’s hat replaced a fireman’s hat and bells replaced a tambourine (Krantz & McClannahan, 1998).

Interobserver agreement data were collected for one third of the sessions across all phases of the study. Overall agreement was 96.56% with a range of 75 to 100. Results suggested that all three subjects eventually emitted scripted, unscripted, and elaborated statements. When the new communicative recipient was introduced all subjects increased their number of interactions. They also noted that subjects repeated their scripts at almost every given opportunity. Last, they found that all subjects were more likely to use scripts in association with new activities versus activities that were used to teach the scripts (Krantz & McClannahan, 1998).
Krantz and McClannahan (1998) concluded by noting that an inadvertent feature of the intervention was the communicative recipient's responses to scripted statements. Subjects often repeated these responses or used pieces of them to form elaborated statements. Thus, the response to "Look," while the subject displays a Lego® bridge, such as "It's a bridge" later led to subject comments like, "a pretty bridge" (Krantz & McClannahan, p. 200). Krantz and McClannahan anecdotally noted that imitations decreased as unscripted responses increased Krantz and McClannahan suggested that future research should focus on the frequency of imitations during script training. They also suggested that future research should address the effect of script training on peer interactions. And that script fading should be compared to verbal prompting and modeling. They stated that a relative strength of the intervention was that rewards were not given for correct responses yet responses became more sophisticated based on the adults' language models. They surmised that this type of interaction may be naturally reinforcing for children with autism.

In an extension of the work of Krantz and McClannahan (1993, 1998) Sarokoff, Taylor, and Poulson (2001) examined the effects of a naturally occurring cue on the ability to completely fade cues for scripted statements taught to children with autism. Subjects were two children with autism. Both subjects were able to read at least 50 words. The first subject, Lou age 8, had a borderline intelligence score on the Stanford-Binet. Jack, age 9, scored in the "...moderate range of mental retardation." (p. 81) on the Weschler Intelligence Scale for Children-III.

Sessions were conducted in a classroom, a room designated for treatment, and a room designated for activities. Two sets of items with embedded text were used (i.e,
video game boxes and common snack food packages). Each item was placed on a piece of paper containing the target script. Each script had six to seven statements that began with the word displayed on the target cue item. Participants each had reciprocal scripts. Sarokoff et al. (2001) identified two dependent variables, scripted and unscripted statements. Scripted statements were verbatim verbalizations of the target script. Unscripted statements were both novel and unprompted.

A multiple baseline across scripts design was used to measure the effects of script fading with naturally embedded cues on subjects' abilities to increase conversational statements. Prior to the commencement of the study, each subject was taught to read their script using praise and tokens. During baseline, subjects were seated together at a table with target items present. Subjects received the instructions, “have a snack” or “play video games” (Sarokoff et al., 2001, p. 82). During intervention, participants consumed or played with target items when directed to do so by their scripts, e.g., “Let’s eat our snacks” (Sarokoff et al., 2001, p. 82). Only gestural prompts were used to direct subjects to their scripts when necessary.

New scripts were introduced when 50% accuracy was achieved. When all scripts were memorized they were faded in five steps. First, 25% of the end of the script was removed. Second, 50% of the end of the script was removed. Third, only the target cue item package and the first letter of each line remained. Fourth, the item package and a blank paper remained. Last, only the item package remained. After one and three months, six 3 minute follow-up sessions were conducted to assess generalization. Also novel items and novel peers were introduced; novel peers were given a script. Last, six more 3
minute sessions were conducted to assess responses in the absence of instructions or adults (Sarokoff, et al, 2001).

Interobserver agreement data were collected for 80% of the sessions. Agreement during baseline was 100%. During intervention agreement for Lou was 93% and agreement for Jack was 96%. Results indicated that both students increased their frequency of making statements after script fading was implemented. Results also showed that both subjects generalized these skills to novel stimuli and novel peers. Last, both subjects continued using scripted statements in the absence of adults and instructions (Sarokoff, et al, 2001).

Sarokoff et al. (2001) concluded that their script fading procedure was effective in increasing conversational statements made by children with autism. However, they also noted that unscripted statements did not occur in the absence of instruction or adults. Thus, they concluded that these elements of the intervention may influence the use of novel statements. They also postulated that perhaps the presence of mands in the scripts combined with procedures used by adults to prevent access to reinforcers may also be responsible for the lack of novel, or unscripted, statements.

Sarokoff, et al. (2001) noted limitations to their study. First, reinforcement was available with no contingency during baseline, yet during intervention reinforcement was contingent on reading the script. This may have caused a greater level of motivation to perform during intervention. They also noted that contextually embedded cues may be limited in that they may not effect conversation about past and future events. Also, this study did not examine whether the scripts taught generalized to trained food items when presented without their respective packages (i.e., the embedded cue). Last, no
pretreatment data were collected so generalization measurements should be taken with caution. No suggestion for future research is offered.

Ross (2002) conducted an investigation designed to determine the function of incorrect responses of children with autism during social conversations. Ross also investigated the effects of using textual prompts and scripts to teach functionally equivalent responses. Last, Ross compared the effects of a token economy versus that of extinction to decrease incorrect statements of children with autism. Subjects were three children with autism.

All three subjects had received an independent diagnosis of autism based on criteria specified in the DSM-IV. The first subject, Mark, age 11, scored an age equivalent of 9.0 in communication and 6.6 years in social skills on the Vineland Adaptive behavior Scales. Mark could engage in a conversation but he often dominated the conversation and had restricted topics. The second subject, Lori, age 9, scored an age equivalent of 7.0 in communication and 3.1 years in social skills on the Vineland Adaptive behavior Scales. Lori’s social communication often consisted of delayed echolalic answers to questions that were posed. Last, Ann, age 14 years 10 months, scored an age equivalent of 13.3 in communication and 9.0 years in social skills on the Vineland Adaptive behavior Scales. Ann also focused on restricted topics during conversations (Ross, 2002).

All three subjects were presented with written scripts. Lori’s scripts were printed from a computer and mounted on colored paper. Question types were coded by color to provide additional support as a prompt. Lori’s scripts consisted of 20 questions. Mark’s scripts were handwritten on a yellow legal sized pad; three versions were created in
random order. Ann’s scripts included words to say and written behavioral instructions. Ann’s final script consisted of 35 lines; 16 for her communicative partner. A token economy was also instituted for appropriate responding. A variable ratio reinforcement schedule and cost response was used to reinforce appropriate behavior and punish inappropriate statements. Mark and Lori’s sessions were recorded on audio tape, Ann’s sessions were recorded on videotape. Mark and Lori’s sessions were held in an empty room with desks in their school. Ann’s sessions were held in her home and at a university conference room (Ross 2002).

Ross (2002) defined three dependent variables. A correct response was scored if Mark or Lori answered a question without giving erroneous information; or if Ann responded with more than one word. A faulty response was one that gave additional information, contained a reference to a topic of preservation, and was wholly based on a preservative topic. Additionally, if Ann omitted a response, that was scored as a faulty response. A conversational unit was when a subject asked and answered a question during their conversational turn. Measurements for Ann also included yes/no responses, questions, elaborations, omissions, and comments on preservative topics.

First, a functional analysis of incorrect conversational responses was conducted on all three subjects. Probes of peer interaction were conducted with Ann because reports indicated that she emitted more repetitive responding with unfamiliar peers. A multielement design was used; each participant had different phases. During baseline sessions, the experimenter posed questions to the subjects and attended to answers. Correct responses were reinforced with tokens. Ann’s baseline sessions were conducted by a peer in her home. Questions were posed about one time per minute. Functional
communication training consisted of two parts. First, responses were trained. Second, subjects were taught to initiate a reciprocal conversation. Training consisted of first learning to read scripts with 80% accuracy. Once this was accomplished, part two of the functional communication training was implemented (Ross 2002).

In part two, the experimenter asked subjects to pose their questions. During this time, subjects’ written scripts were presented. If the subjects did not read their scripts after 5 seconds, they were prompted. If they attempted to answer the question they had read, the response was scored as a faulty. Contingent tokens were available during training. Criterion was 80% accuracy for two consecutive sessions. For Mark, a combined extinction and script training phase was implemented to ignore faulty responses. Ann’s training consisted mainly of practicing her script with multiple exemplars. A second baseline was implemented followed by probes with communicative partners who were not involved in training; no probes were conducted with Lori (Ross, 2002).

Results indicated that attention was maintaining the faulty responses of all three participants. Ross (2002) also found that faulty responses decreased rapidly when script training with a token economy was instituted. Also, reciprocation increased and was maintained during the reversal. Ross also noted that the study is unique in that the scripts included instructions to the speaker such as “Comment” or “Make a suggestion” (Ross, 2002, p. 360).

Ross (2002) concluded that the findings support the efficacy of training scripts combined with a token economy to reduce faulty statements and increase correct responding during conversations for children with autism. She did note some limitations
of the study. First, the multielement design used did not allow for an analysis of the weight of contribution of each component. Second, taught conversations may have represented high demand situations for subjects', thus impacting the rate and accuracy of responding. Third, different settings were used for Mark and Lori than for Ann. Last, response definitions may have caused an over- or underestimation of subject performance. Ross suggested that future research might consider decreasing faulty responding in the absence of cost response or extinction.

Charlop-Christy and Kelso (2003) examined the effects of a script program using cue cards on the conversational speech of verbal children with autism. Generalization was tested with untrained topics, multiple communicative partners, and in a variety of settings. Subjects were three boys diagnosed with autism by a trained psychologist using DSM-V criteria. Further, all subjects had the ability to read the scripts that were presented.

The first subject, Jonah, age 8 years 10 months, had a mental age of 4 years 4 months on the Vineland Adaptive behavior Scales. He also scored a letter and word discrimination age equivalent of 7 years 6 months on the Woodcock-Johnson Psycho-Educational Battery Revised. The second subject, Brandon, age 8 years 6 months, achieved a Verbal Scale IQ of 79 on the Wechsler Intelligence Scale for Children – Revised. He also achieved a communication age equivalent of 5 years 8 months on the Communication Domain of the Vineland Adaptive Behavior Scales. The third subject, Cameron, age 11 years 7 months, scored a mental age equivalent of 4 years 10 months on the Communication Domain of the Vineland Adaptive behavior Scales. He achieved a verbal IQ of 60 on the Wechsler Intelligence Scale for Children – Revised; and a 3.4
grade equivalent in reading, and 4.1 grade equivalent in letter-word discrimination on the Woodcock-Johnson Psycho-Educational Battery Revised (Charlop-Christy & Kelso, 2003).

Each script had seven lines and centered on abstract topics. Each line of the script had a statement and a question. The first line of each script only had a question and the last line consisted of a concluding statement. Each line of the script was presented on a separate cue card. Intervention took place in a therapy room at a table. Generalization was conducted in the subjects’ after-school program playroom. A multiple baseline across subjects with generalization probes was used to measure the effects of the intervention (Charlop-Christy & Kelso, 2003).

During baseline, while sitting across from the subject, the experimenter asked a question. Subjects had 10 seconds to respond. No cue cards were available to the subjects. Responses were scored correct if the subject answered the question then asked one. During baseline, the experimenter modeled the first expected response by telling the subject what to say in response to the question. The experimenter also emitted prompts designed to elicit conversational speech from the subject. Reinforcement was provided for correct responding; and continued through the study. Generalization probes were conducted throughout the entire length of the study; conditions were the same as in baseline (Charlop-Christy & Kelso, 2003).

During training, subjects were posed a question by the experimenter, handed a cue card, and verbally prompted to, “read it” or “read it aloud” if necessary (Charlop-Christy and Kelso, 2003, p. 114). Subjects were then instructed to look at the experimenter and repeat the scripted statement. Subjects received reinforcement after correctly completing
their three scripted lines. During the testing phase, subjects were engaged in scripted statements in the absence of cue cards. If subjects did not achieve a 100% correct response rate, cue cards were presented again. This was repeated until the subjects achieved 100% correct responding for two consecutive trials.

Interobserver agreement data were collected for 50% of trials across the experiment. Average agreement during baseline was 89.4%, 94.9% during script training, 92.1% during testing, and 93.1% during generalization. Charlop-Christy and Kelso (2003) reported that none of the subjects met criteria during baseline training, yet all learned scripted conversations quickly when training with cue cards was implemented. Subjects met criteria during the testing phase; where no cue cards were used unless necessary to correct incorrect responses. They further reported that subjects generalized to untrained topics and conversational partners (Charlop-Christy & Kelso, 2003).

Charlop-Christy and Kelso (2003) explain that their research extended the findings of Krantz and McClannahan (1993) in several ways. First, the work of Krantz and McClannahan taught initiating whereas their study taught a reciprocal conversation. Also, Charlop et al. scripts were presented on cue cards that were immediately removed and did not require a fading procedure, as did the procedure described in Krantz and McClannahan. Last, the procedure extended the duration of the target behavior.

Ganz, Kaylor, Bourgeois, and Hadden (2008) conducted a study on script fading to determine if written and pictorial scripts would increase appropriate conversation in children with autism spectrum disorders. Concurrently, they examined the effects of script fading on unscripted statements and asked whether visual cues would reduce instances of preservative speech. The study included three participants that had received
independent diagnosis of autism spectrum disorder. The first participant was a 12 year old boy with a diagnosis of Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS) who usually played in isolation and rarely interacted with others when he did not need something. He had poor eye contact and often repeated phrases from television and video games. The second participant was a seven year old boy who was diagnosed as having high functioning autism. It was reported that this participant rarely initiated or spoke to peers. He often engaged in self stimulatory behavior including repeating phrases from songs and books. The third participant was an eight year old girl who was also diagnosed with PDD-NOS. She, too, often repeated phrases at rates that were self stimulatory and bothersome to peers.

The researchers employed a multiple baseline with embedded withdrawals across three preferred activities for each participant in five minute sessions. Only two sessions of baseline were held prior to the introduction of the intervention with the first activity. Once the first activity was introduced, the intervention was applied to subsequent activities when scripted statements were at least two times higher than the highest baseline point or when two scripted statements were made consecutively over three sessions if no instances of scripted statements were noted during baseline. This continued until all three activities were exposed to the intervention. In a final phase, all participants returned to baseline for two sessions.

In a pre-teaching phase, each of the participants were taught to read three sets of ten scripted statements with accompanying line drawings to illustrate the statement. The number of scripted statements had to be reduced to three sets of six statements for the youngest participant due to a lower reading ability. During baseline, participants were
brought to the activity and told to engage in it. During intervention, scripts with line picture support were printed on 3”x5” cards and held up behind each participant’s communicative partner’s head so only the participant could see it. Scripts were faded in three steps. First, the script was cut in half and only the first half was presented. Next, only the first word was presented. Then, participants returned to baseline where there were no cue cards. In conjunction with scripts a quiet picture was introduced. It depicted a face with a finger over its lips (meaning “Shhh!”). Participants were told that when this card was shown to stop repeating phrases. During intervention when participants engaged in preservative speech, they were shown this card until they stopped.

During baseline and intervention sessions, data were collected on the frequency of scripted, unscripted, and preservative speech comments made by each participant. Two independent observers collected these data and products were compared to calculate a percentage of interobserver agreement. Agreement for participant one was 95% with a range of 70%-100%; agreement for participant two was 89% with a range of 71%-100%; and agreement for participant three was 92% with a range of 70%-100%.

Ganz et al (2008) reported that scripted statements increased for all three participants and concluded that script fading was very effective for increasing the frequency of scripted statements made by participants. However, in a return to baseline condition the frequency of scripted statements made by all participants decreased. Ganz et al. also concluded that script fading was ineffective in increasing the frequency of unscripted statements made by children with autism spectrum disorders. They noted that many of the unscripted statements made by their participants were often inappropriate and many times not even directed to their communicative partner. Nevertheless, Ganz, et
al. stated that their script fading procedure did demonstrate potential for positive social outcomes. For instance, they noted that participants all decreased their use of preservative comments when the quiet cue card was displayed. Further, two of the participants continued to make preservative comments less frequently even after the card was removed. They also noted that unscripted statements had increased in frequency; however they were unable to tease out whether those unscripted statements were meaningful in context. They suggested that future research might consider the contextual appropriateness of scripted and unscripted statements.

Brown, Krantz, McClannahan, and Poulson (2008) conducted a study to test their hypothesis that script fading could be used to teach individuals with autism to increase conversational skills and that fading techniques could shift stimulus control of the conversation from the script to the object that was the topic of conversation. Further, it was surmised that learned conversational speech would continue in the absence of a script or any other prompting. Three children with autism participated in this study. All three participants had been diagnosed with autism by an outside agency and all had verbal communication skills, but did not initiate to others often. The first participant was a 13 year old boy with an age equivalent score of four years ten months on the Peabody Picture Vocabulary Test and an age equivalent of four years zero months on the Vineland Adaptive behavior Scale. The second participant was a nine year old boy with an age equivalent score of four years nine months on the Peabody Picture Vocabulary Test and an age equivalent of five years five months on the Vineland Adaptive behavior Scale. The third participant was a seven year old boy with an age equivalent score of two years
eleven months on the Peabody Picture Vocabulary Test and an age equivalent of one year eight months on the Vineland Adaptive behavior Scale.

Both teaching and generalization sessions were held in a carpeted classroom and were videotaped. The classroom had been rearranged to resemble a store environment; three mock store situations were alternately created a video store, a sporting goods store, and a convenience store. Three actual retail stores served as the community settings for pre-test sessions and post-test sessions. Within each session nine training items and nine generalization items were presented in each store.

During a pre-teaching phase, participants were taught to use a mechanical counter each time an instructor used a similar one to record a correct answer by the participant during discreet trial training. This, Brown, et al (2008) reasoned, would be a less obtrusive means of recording reinforcement in the community versus a token board. Also, object identification probes and lessons insured that each participant could verbally identify all of the items that scripts revolved around. Last, during pre-teaching all participants were taught to read all 93 words used in the scripts.

Scripts were presented on adhesive labels that were attached directly to the item referred to by the script. Manual guidance was used when necessary to get participants attend to their script. When a participant achieved at least 10 interactions during a session without prompts the script fading procedure was implemented. A seven step fading procedure was used where the last word was removed, then the last two words were removed, then only the first word remained. Then, these first words were removed from the objects three at a time. Thus, in the first of these sessions nine objects had the first word, then six objects, then three, then one, then none.
A multiple baseline across settings design was used to determine the effects of the script fading package which included scripts, fading, and reinforcement. Data were collected on the frequency of scripted, unscripted, and generalization interactions. Interobserver agreement data were taken by two independent observers who scored sessions from videotape and audio-tape recordings. Interobserver agreement during the script-fading phase ranged between 82% and 93%. During community pre-test sessions, there were no noted instances of interactions to record. Last, during community post test sessions agreement ranged from 89%-100%.

Brown et al. (2008) reported that the script fading package administered in this study caused an increase in the frequency of conversational interactions for all participants. They also reported that while none of the participants engaged in any conversational interactions during the pre-test visits to the community store, that all of them had engaged in interactions. Brown et al. concluded that script-fading is effective in teaching children with autism to engage in and sustain verbal interactions in the absence of any prompt and driven by naturally occurring environmental factors.

Summary of Research Related to Written Prompted Script Training

In most of the studies on written prompt script fading, it was reported that the written prompt was completely removed while participants continued to repeat learned scripts in context (Brown, et al., 2008; Charlop-Kristy & Kelso, 2003; Ganz et al., 2008; Krantz & McClannahan, 1998, Ross, 2002;). However, in two of those studies (Krantz & McClannahan, 1998; Sarokoff et al., 2001) some type of prompt remained.
Most of these researchers found that participants often made statements that were elaborations of the scripts that were taught (Brown et al., 2008; Charlop-Kristy & Kelso, 2003; Krantz & McClannahan, 1993, 1998; Ross, 2002; Sarokoff et al., 2001); often referred to as unscripted statements. Ganz (2008) noted that unscripted statements did increase for one of their three subjects. However, this increase was only observed during the intervention phase and was not otherwise noted. Nevertheless, the majority of evidence suggests that script fading will likely result in the production of novel statements made by those who receive this treatment.

Written prompt script fading studies have focused on one of two communicative purposes; initiation (Brown, 2007; Krantz & McClannahan, 1993, 1998) and improvement in conversational speech (Charlop-Kristy & Kelso, 2003; Ganz, 2008; Ross, 2002; Sarokoff, 2001). And like audio prompt script training has used both peers (Ganz, 2008; Krantz & McClannahan, 1993; Sarokoff et al., 2001) and adults (Brown et al., 2008; Charlop-Kristy & Kelso, 2003; Krantz & McClannahan, 1998; Ross, 2002) as communicative partners.

Of the written prompt script fading studies reviewed, most have reported some form of generalization of learned scripts to novel stimuli (Brown et al., 2008; Sarokoff et al., 2001) circumstances (Charlop-Kristy & Kelso, 2003; Krantz & McClannahan, 1993, 1998), novel conversants (Charlop-Kristy & Kelso; Krantz & McClannahan, 1993; Sarokoff et al.), and/or novel environments (Charlop-Kristy & Kelso; Krantz & McClannahan, 1993; Sarokoff et al.). In two studies generalization was not reported (Ganz, 2008; Ross, 2002). However, the majority of evidence suggests that verbal communication skills taught through script fading are durable enough to generalize.
Summary

Script fading, as a method of teaching children with autism appropriate verbal responding in context, has evolved from basic rehearsal sessions in which participants are instructed in precisely what to say, to a more precise procedure in which written prompts are systematically produced and then faded away. Most of the script training reported in the literature that used some form of auditory prompting had some type of activity embedded into the activity (i.e., sociodramatic play) (Goldstein & Cisar, 1992). However, written prompt script fading procedures are mainly concerned with the verbal behavior specifically.

Teaching verbal communication skills to children with autism is a desirable goal because language deficit is a defining characteristic of autism. Script fading using a written prompt is a promising approach because it has been reported that not only do children with autism learn to increase appropriate scripted statements after script fading training, in many cases it has been reported that both unscripted and/or elaboration of learned scripts are also observed after script fading training. Moreover, in a majority of studies generalization of those learned skills have been reported across, novel people, settings, activities, and stimuli.

Of all of the studies on script fading only one was conducted in a public school. Gaylord-Ross, et al. (1984) conducted their study in, “...a large suburban high school” (p. 231). In another study, (Ross, 2002) two of the three participants were exposed to study conditions at their regular school; which was a public school program. However, script training in Ross’ study was part of a training package designed to reduce incorrect and perseverative speech responses. The study concerned itself with three separate
objectives and did not solely focus on effects of script training; the study also evaluated the effects of functional analysis on incorrect verbal responses and cost response.

The present study contributes to this body of research on written script fading procedures by administering a written script fading procedure to children with autism in a typical special education classroom for children with autism in a public school. All of the participants in this study were assigned to the investigator’s classroom serving children with autism in the primary grades or to the classroom serving children with autism in the intermediate grades on the same campus. Thus, this study examines the effects of script fading only in a typical public school program for children with autism.

Also, whereas previous studies involved the skills of initiating conversation, initiating and sustaining conversation, and conversational speech, the present study addressed the efficacy of script fading to teach children with autism to reciprocate information about objects and pictures using script fading. Also, generalization to novel objects and pictures was assessed.
CHAPTER 3

METHODOLOGY

Overview

The purpose of this study was to determine the effects of a script fading procedure on the abilities of young children with autism to reciprocate information about objects and pictures. This chapter identifies the specific research questions and the experimental design used to identify the effects of the script fading procedure on the dependent variables. Participants and the setting are also described followed by a detailed description of the procedures used in each phase of the experiment. Finally, a brief discussion on how the data are analyzed is presented.

Research Questions

This study examined the following:

1. What are the effects of a script-fading procedure on scripted statements, unscripted statements, and non-responses used by children with autism to reciprocate information to a peer about an object that is in their possession?

2. What are the effects of a script-fading procedure on scripted statements, unscripted statements, and non-responses used by children with autism to reciprocate information to a peer about a picture that is in their possession?
3. Will children with autism who learn scripts to reciprocate information about an object that is within their possession use that learned reciprocal script to share information about a novel item?

4. Will children with autism who learn scripts to reciprocate information about a picture that is within their possession use that learned reciprocal script to share information about a novel picture?

Experimental Design

A multiple baseline across participants design was used to examine the effects of script fading on the ability of participants to reciprocate information. This model was selected because participants were taught a new behavior that was unlikely to turn off through a reversal. "The multiple baseline...is perfectly suited to handle such cases [i.e., where a behavior cannot be turned off]...(Bailey & Burch, 2002, p. 166). "In the multiple baseline design across subjects...the dependent measure is intersubject,...in which several different individuals...exhibit the same behavior under the same or similar stimulus conditions (Tawney & Gast, 1984, p. 256)." In this design frequency is measured for the same target behavior under similar environmental conditions across participants (Tawney & Gast). This study was designed to measure the frequency of scripted, unscripted, and non-responses made by participants under the same circumstances. The intervention was implemented with subsequent dyads across the multiple baseline design when the preceding dyad had begun its first fading step.

In order to simultaneously answer questions about the effects of script fading on the ability of participants to reciprocate information about pictures and objects, two
scripts were taught simultaneously and were rapidly alternated with an upper limit (i.e., no more than) of two consecutive administrations of any one script. Thus, the multiple baseline employed in this study contained an alternating treatment (Barlow & Hersen, 1984). This design allows an examination of, "...the relative effectiveness of two (or more) treatments or conditions (Barlow & Hersen, p. 252)."

Participants

There were four first grade students, one second grade student, and one fifth grade student who participated in this study. All students attended a self-contained class for children with educational diagnoses of autism in a large public school district located in the southwestern United States. Participants were drawn from two classes; a primary autism classroom serving children grades 1 and 2, and an intermediate autism classroom serving children grades 3 through 5. The pool of subjects represents a convenience sample because they were drawn from a group readily accessible to the investigator (Keppel & Wickens, 2004).

Eligibility in this class meant that a trained and licensed school psychologist using standardized measures had found each student eligible for special education services under the category of autism. Each participant had some degree of ability to recognize and read words and to comprehend what was read as a prerequisite for participation in this study (see Table 1). Each participant also had sufficient receptive and expressive language skills to participate in this study.

The participants in this study were recruited through a letter of introduction; forwarded to each student in the investigator's class (Appendix II). One student was
solicited from the intermediate autism classroom because only five students were recruited from the investigator's primary autism class.

Dyad one consisted of Jon and Jason. Jon was a second grade student who spent a large majority of his day in a general education program. Jason was the only participant that came from the intermediate autism program; he was in the fifth grade at the time of the study. These participants were matched due to both of them having scheduling constraints. Dyad two and three consisted of all beginning first graders. These dyads were constructed based on reading ability. Dyad two, Sam and Abe represented the middle scores while dyad three, Mort and Dan, represented the best and lowest reading scores (see Table 1).

Each participant was administered four screening measures to insure that requisite skills necessary for participation and benefit from the script fading procedure were present. Those four measurements were the Letter-Word Identification and Passage Comprehension sub-tests of the Woodcock-Johnson III, the Expressive One-Word Picture Vocabulary Test, and the Receptive One-Word Picture Vocabulary Test (see Table 1).
Table 1

*Test Scores in Age Equivalent*

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<th>Participant</th>
<th>Age at Testing</th>
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<th>W-J III PC</th>
<th>EOWPVT</th>
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<tr>
<td>Jason</td>
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<td>6-10</td>
<td>6-0</td>
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<tr>
<td>Sam</td>
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<td>5-6</td>
<td>3-8</td>
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<tr>
<td>Abe</td>
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<td>6-6</td>
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<tr>
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<tr>
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<td>7-1</td>
<td>4-11</td>
</tr>
</tbody>
</table>


Only children whose parents provided signed consent letters were considered for participation in this study (Appendix I). Potential participants who did not pass the screening measure received a letter explaining why their child's participation would not have been beneficial (Appendix II). Participants represented varied cultural backgrounds including Sam and Mort were African-American, Jason was Asian, Jon and Abe were Caucasian, and Dan was Hispanic.

**Setting**

Intervention occurred in the students' regular primary autism classroom located on a general education elementary school campus. The primary autism classroom was
shaped like a rectangle. The back ten feet were tiled from the right wall to the left wall the rest of the class was carpeted. Along the back wall beginning from the left was a door to a bathroom that adjoins the intermediate autism classroom. Continuing along to the right immediately adjacent to the bathroom door was a bulletin board with a table in front of it used for circle time and art activities. To the right of this area was a kitchen area that was cordoned off to students through the use of bookcases and metal cabinets. Directly opposite the circle-time area was a computer center with two PCs. On the right wall of the room, as one stands facing into the room from the entry, was a reading center consisting of a white board and a kidney shaped table with chairs around it. The kidney table jutted up against the back of the metal cabinet separating the kitchen area leaving one entrance for the teacher to access the whiteboard and the inside center seating position. Directly opposite from the reading center was a student desk for independent activities, a white board, and the door to the bathroom.

All pre-intervention training occurred at the reading center with the participant seated on the inside center seating position. The investigator sat on the outside corner of the kidney table opposite the metal cabinet that separates the kitchen area, facing the child. Intervention occurred at a rectangular table adjacent to the computer center. Here, participants sat across from one another while the investigator sat immediately adjacent to both participants at the end of the table.

During study sessions, those students who were not engaged in sessions were hosted by the intermediate autism teacher in the adjacent classroom joined by a common student restroom. During this time students participated in teacher prepared regularly
scheduled activities conducted by the students’ regular classroom aid. This provided a
distraction free environment for sessions to occur in.

Definitions

Dependent Variables

"Scripted [Reciprocations were] those that match[ed] the written script, with the
exception that, conjunctions, articles, prepositions, or pronouns could be altered or
deleted (e.g., substituting "[the]" for "[my;]" or dropping "the"), and verb tense could be
changed (Krantz & McClannahan, 1993, p. 124)" thus a participant could have said,
"saw" instead of "see."

"Unscripted [Reciprocations were] any contextually appropriate verbal
production that differed from the script by more than, conjunctions, articles, prepositions,
pronouns, or changes in verb tense... (Krantz & McClannahan, 1993, p. 124)."

A Non-response was defined as any utterance (word, phrase, or sentence) that was
not prompted by the investigator that occurred within 5 seconds of a statement from the
participant’s communicative partner, and was contextually inappropriate. An example
was an echolalic or a delayed echolalic statement, or a statement about an object or
activity that was not within the possession of the participant at the moment when the
statement was uttered. Complete silence for 5 seconds when the participant was expected
to respond according to the script also was considered a non-response.

Because the initial statement made during the script was an initiation and not a
reciprocal statement this first statement in the script was not scored as a reciprocal
statement. Thus, participants took turns being the initiator of the conversation in a semi
random rapidly alternating fashion with an upper limit of two consecutive initiations. Turns to initiate occurred based on a predetermined schedule arrived at through coin toss. This precaution served both to allow each participant within a dyad an equal number of opportunities to respond, and helped reduce the possibility that order effects confounded results (Barlow & Hersen, 1984).

**Independent Variable**

The independent variable was scripts that were presented to the participants on an 8½” x 11” sheet of white paper printed in a 26 point Arial font. Scripts were placed in clear page protectors to increase durability. The participant’s name appeared next to their scripted statements to ease the identification of their lines. This procedures used in this study were designed to teach the following scripts that had been taken verbatim from a commercially available curriculum for children with autism (Maurice, Green, & Luce, 1996). Two scripts are presented. The first script is a reciprocal conversation that allows each conversant to share information about an object that was within his possession. The second script is a reciprocal conversation that allows each conversant to share information about a picture that was within his possession.

**With objects**

Participant A: “I have a (duck).”

Participant B: “I have a (cow).”

Participant A: “My duck is yellow.”

Participant B: “My cow is white.”

Participant A: “My duck says ‘quack.’”

Participant B: “My cow says ‘moo.’”
Participant A: My duck lives in a pond.”

Participant B: “My cow lives on a farm.”

With pictures

Participant A: “I see a (ball).”

Participant B: “I see a (flower).”

Participant A: “I see a car and a tree.”

Participant B: “I see a man and a cake.”

Participant A: “I see a red hat.”

Participant B: “I see a blue ball.”

During intervention sessions, the participants were seated across from one another. The script designed to facilitate reciprocation of information about an object (script A) within the participant’s possession as described above, was presented to the participants along with the conversational referents. If necessary, students were prompted to attend to their script with gestural prompts. Verbal models of statements and/or verbal prompts were generally not provided during study sessions. There were a few instances early in the study when verbal instructions were necessary to redirect inappropriate behaviors. A subsequent script designed to facilitate reciprocation of information about a picture (script B) was introduced to participants within the same dyad when only one word was left from the first script at fading step three.
Procedures

Phase I Testing

The script fading intervention requires that participants have the ability to recognize and read some words in order to benefit from the presence of written scripts. Likewise, a participant has to have at least basic receptive and expressive language in order to comprehend the scripts being taught; and not simply recite them by rote. The Woodcock–Johnson-III Letter-Word Identification subtest was administered to each participant by the investigator prior to commencement of the study. The purpose of doing so was to demonstrate that the participants could at least identify what a word is. The Letter-Word Identification subtest, ...

...measures the subject's word identification skills. The initial items require the individual to identify letters that appear in large type on the subject's side of the Test Book and the remaining items require the person to pronounce words correctly. The individual is not required to know the meaning of any word. The items become increasingly difficult as the selected words appear less and less frequently in written English. Letter-Word Identification has a median reliability of .91 in the age 5 to 19 range and .94 in the adult range (Mather & Woodcock, 2001, p. 11).

Participants had to achieve a score of at least an age equivalent of 5 years 4 months to be included in the study. The youngest participants were in the beginning month of first grade at the time of test administration.

The Passage Comprehension subtest of the Woodcock-Johnson-III was also administered to participants. The first part of this subtest,
...involve[s] symbolic learning, or the ability to match a rebus (pictographic representation of a word) with an actual picture of the object. The next items are presented in a multiple-choice format and require the person to point to the picture represented by a phrase. ... Passage comprehension has a median reliability of .83 in the age 5 to 19 range and .88 in the adult range (Mather & Woodcock, 2001, p. 13).

An age equivalent score of 5 years 6 months was minimally required to demonstrate the ability to comprehend a phrase.

Also, standardized speech/language measures were administered by a licensed speech and language pathologist. Those measures were the Expressive One-Word Picture Vocabulary Test (Brownell Editor, 2000) and the Receptive One-Word Picture Vocabulary Test (Brownell Editor, 2000).

The Expressive One-Word Picture Vocabulary Test (EOWPVT) is an individually administered, norm-referenced test designed for use with individuals ages 2 years 0 months through 18 years 11 months. The test offers a quick and reliable measure of an individual’s English speaking vocabulary, which is assessed by asking the individual to name objects, actions, and concepts pictured in illustrations (p. 10).

Performance on this test at the 2 year old level demonstrated that participants could expressively identify at least some objects in several categories. Those categories include transportation, plant life, food, animal life, and common objects (e.g., book or scissors). All of those categories are represented in the proposed scripts. Although performance at the 2 year old level is low for a 6 to 7 year old, language delay is characteristic of autism.
The other language assessment that was administered was the Receptive One-Word Picture Vocabulary Test (Brownell Editor, 2000).

Receptive One-Word Picture Vocabulary Test (EOWPVT) is an individually administered, norm-referenced test designed for use with individuals’ ages 2 years 0 months through 18 years 11 months. The test offers a quick and reliable measure of an individual’s English hearing vocabulary, which is assessed by asking the individual to identify an illustration that depicts the meaning of a word presented orally by the examiner (p. 10).

Performance on this test at the 2 year 3 month old level demonstrated participants’ ability to identify some nouns and some actions. The scripts only had those concepts present so no higher score was necessary to demonstrate ability to participate in and benefit from the intervention.

Phase II Pre-teaching

This study used a modified version of the intervention method described by Sarokoff et al. (2001) to teach, “...children with autism to engage in conversational exchanges [using] script fading with embedded textual stimuli (p. 81).” Prior to the initiation of the study, participants were taught to read their portion of the script by the investigator using verbal praise. Sarokoff et al. also instituted this procedure with the exception that they included tokens following accurate recitations of the script; this study did not use token reinforcement. During this phase, each participant was individually taught to read their script from two perspectives. In the first perspective, the participants were taught the script when they were the initiator. In the second perspective, the
participants were taught the script when they were the recipient of an imitative statement made by their conversational partner.

The teaching of participants' lines of a script was accomplished through direct verbal instruction. For example, the investigator told participants, “Go ahead, read this sentence,” as he pointed to the sentence. Upon successful reading of the sentence the investigator gave verbal praise to the participants for “good reading.” If the participant did not read the sentence correctly the investigator modeled reading the sentence and pointed to each word as it was being read. The participant was then asked to reread the sentence.

Also, an expressive picture identification program as described by Maurice, et al. (1996) was implemented to probe or teach participants to verbally label common items. The procedure was:

Sit in a chair facing the child. Establish attending and present a picture for the child to view. Say “What is this?” Prompt child to label the picture and reinforce the response. Fade prompts over subsequent trials. Differentially reinforce responses demonstrated with the lowest level of prompting. Eventually only reinforce correct, unprompted responses (p. 82).

Specific items that were probed or taught, when necessary, were: red ball, car, hat, flower, man, cake, blue ball, tree, house, red bicycle, woman, pizza, red scarf, girl, dog, and kite. These were the items in the pictures around which the picture script revolved. Specifically, the script training set of pictures depicted the following items. Picture one depicted a ball, car, tree, and red hat. Picture two depicted a flower, man, cake, and a blue
ball. Generalization probe pictures depicted the following. Picture one depicted a house, woman, red scarf, and a dog. Picture two depicted a red bike, pizza, girl, and a kite.

Phase III Creation of Materials

Pictures were taken to present to participants that correspond to the scripts they were exposed to. Two sets of two pictures were created. Digital pictures of actual scenes containing target objects were taken and printed on 8” x 10” glossy photo paper; photographs were presented in clear page protectors for durability. In the first instance, one picture depicting a ball, a car, a tree, and a red hat was produced. In the second instance, one picture depicting a flower, a man, a cake, and a blue ball was produced. In the third instance, a picture depicting a house, woman, red scarf, and a dog was produced. In the last instance, a picture depicting a red bike, pizza, girl, and a kite was produced. The former two pictures were used for script fading training and the latter two pictures were used for generalization probes.

Phase IV Experimental Arrangement

Similar to Sarokoff, et al. (2001) textual scripts and prompts were not provided during baseline. The participants sat directly across from each other at a rectangular table; the investigator sat directly adjacent to the participants. A verbal instruction (i.e., “Talk a lot” [Krantz & McClannahan, 1993, p. 124]) along with the presentation of the conversational referents (i.e., plastic farm animals) delimited the beginning of a session. No other objects were available other than the plastic farm animals that were the subject of the target script. The participants were allowed to play with the plastic animals if they selected to do so.
Anything a participant said during sessions that was directed to the other participant within the dyad and that met the criteria for either a scripted reciprocation or an unscripted reciprocation as defined above was recorded during baseline sessions. Non-responses were also measured during baseline sessions. All sessions across all conditions lasted for 3 minutes. This time frame was based on the brevity of each script being taught. Two, 3 minute sessions, were conducted for each dyad on a daily basis following a traditional school schedule of Monday through Friday save holidays and absences. One session occurred in the morning and one in the afternoon.

In Krantz & McClannahan, (1993) and Sarokoff, et al., (2001) the fading procedure used was, (a) 25% of the words were faded from back to front; (b) half of each sentence was faded; (c) the first letter of each line remained; (d) only the paper remained; (e) in Srokoff et al. only the package with the embedded text remained and in Krantz & McClannhan only a piece of paper with quotation marks remained. This study emulated that study with the exception that the paper or written cue was eliminated altogether.

During the intervention phase, under the same conditions described in the baseline phase with the participants seated across from one another at the end of a rectangular table. The investigator sat at the head of the table directly adjacent to both participants and the following steps were implemented:

1. The script was presented to the participants along with the conversational referents.

2. When necessary, the investigator prompted participants to attend to their script with gestural prompts. Verbal models of statements and/or verbal prompts were not provided except as described earlier.
3. Initially, when each participant had read his script with at least 90% accuracy for at least three consecutive sessions, a five-step script-fading procedure was introduced. However, after four weeks some participants had been making careless errors in their recitation of the script preventing them from meeting criteria for moving to the next fading step. These same participants had already demonstrated a familiarity with the script’s content. Cooper, Heron, & Heward (2007) state that, “When unplanned events or variations occur in the experimental setting, the behavior analyst must either wait out their effects or incorporate them into the design of the experiment (P. 175).” Thus, this condition was incorporated into the study by allowing participants to self correct during sessions if a mistake was made during recitation. This condition also necessitated introducing the third dyad to the intervention before the second dyad began its first script fading step due to time constraints.

The steps in this fading procedure were: (a) 25% of the words (including the participant’s name which cues the speakers’ turns) were faded from back to front, (b) half of each sentence was then faded from back to front, (c) The first letter of each line remained following the participants’ names, (d) only the participant’s names remained, (e) only the conversational referents were presented.

4. A subsequent script (i.e., sharing information about a picture) was introduced to participants within the same dyad when only one word was left in their current script. At this point the two scripts (i.e., about objects and pictures) were semi randomly alternated with an upper limit of two consecutive presentations of the same script.

5. Dyad 2 was introduced to the intervention when the dyad immediately preceding it had begun the first step of fading. Dyad 3 was introduced to the intervention when they
presented a stable baseline after the introduction the scripts to dyad 2. During the last four sessions of baseline, both participants in dyad 3 made zero unscripted statements with the exception of one session in which Dan made two unscripted statements.

To assess generalization, eight 3 minute follow-up sessions were conducted following the last fading step for both scripts. In the first generalization phase, all conditions remained the same as they were in the two previous phases with the exception that the participants received novel plastic farm animals that were already familiar to them (i.e., a pig and a sheep). In the second generalization phase, participants received a new picture depicting common items that had been shown to be familiar to the participant through an expressive picture identification program as described above. During this phase, the number of scripted, unscripted, and non-responses were recorded. All sessions were videotaped so that both treatment integrity and interobserver agreement on outcome measures could be assessed.

**Phase V Social Validity**

Social validity data were collected at the conclusion of the study on the procedures of the intervention (Wolf, 1978). Anecdotal data on the procedures of the study were measured through the distribution of a treatment acceptability survey to relevant stakeholders. Those surveyed included, the participating school’s administrator, the classroom assistant to the primary autism program, and the regular intermediate autism classroom teacher and his assistant. The information obtained was analyzed to find patterns in responding. Those results are reported in narrative form in the discussion section of this dissertation.
Treatment Integrity Monitoring

Treatment integrity is a necessary component to demonstrate a functional relationship between independent and dependent variables (Gresham, Gansle, & Noell, 1993). Gresham, et al. makes recommendations for the measurement of treatment integrity which have been considered here. First, the researcher is cautioned that independent variables should be defined along four dimensions (i.e., verbal, physical, spatial, and temporal) to make replication possible; this has been done in the description of procedures above.

Second, each step of the independent variable should be scrutinized against an accuracy criterion defined by the researcher. This recommendation is also addressed through the use of a treatment integrity checklist prepared by the investigator to be used by two raters to measure the consistency of delivery of the independent variable (Appendix III). Raters scored treatment integrity on 30% of randomly selected sessions across the entire study. Raters included the investigator and a research assistant. The research assistant was a doctoral student assisting in order to fulfill competency requirements of his program.

Third, the following recommended formula was used to calculate a percentage of agreement. Each rater recorded occurrences of correct and incorrect applications of the independent variable. The number of correct occurrences was divided by the number total opportunities and multiplied by 100 (Tawney & Gast, 1984) to calculate a percentage of agreement.

A fourth concern is reactive effects of being observed while delivering the independent variable of observation. Since the investigator was the one who delivered the
intervention the likelihood that the intervention fluctuated due to observation was very low. Also, treatment integrity measures were taken from videotaped recordings independently selected by the research assistant. Thus the investigator had no way of knowing which of the sessions were to be viewed. This condition served to reduce the likelihood of reactivity effects.

Treatment of Data

The data were reduced to line graphs based on the measured frequency of the target behaviors. Data from the line graph has been visually analyzed to answer research questions 1 through 4. Specifically, visual inspection of the line graph has been relied upon because this method, "...has proven to be both practical and reliable, and therefore has been adopted by educators and clinicians, as well as researchers, to evaluate data patterns (Tawney & Gast, 1984, p. 157)." Comparisons of performance across all three dyads, made at the same points in time have helped to determine whether or not changes in the target behaviors can be attributed to the treatment (Kazdin, 1982).

Intensity of magnitude (i.e. mean and level) of behavior change and rate of behavior change (i.e., trend and latency) across conditions and dyads were also examined. When magnitude was considered both mean and level were considered. Comparing means across conditions has allowed for judgments pertaining to consistency of effects to support conclusions. Comparing level of performance across dyads has allowed for judgments pertaining to the reliability of treatment effects. When rate was considered, an examination of trends within dyads was made to demonstrate a systematic increase of performance over time. Latency of change is examined at phase changes to support
conclusions made about the functional relationship between the treatment and the target behavior. Other factors that have influenced conclusions are the variability of individual participant performance during phases, phase durations, and the overall consistency of effect across participants (Kazdin, 1982). These results taken together form the basis for conclusions made herewith.
CHAPTER 4

RESULTS

The purpose of this study was to determine the effects of script fading on the abilities of children with autism to reciprocate information with a peer. A total of four research questions were addressed in this study. A total of six participants were formed into three dyads. A multiple baseline across dyads was employed to answer the research questions. This chapter presents the results of an analysis of the data that were obtained during the study as they relate to each of the research questions. First, interobserver agreement data on response definitions for each participant is reported. This is followed by a report of interobserver agreement on the integrity of the treatment delivery. Then, each research question will be restated and treated in turn. The procedures that were used to analyze the data are explained as are the results of the analysis. The chapter concludes with a discussion of social validity survey results.

Interobserver Agreement

Cooper et al (2007) states that, “Interobserver agreement should be assessed during each condition and phase of a study… (p. 119).” They also state that, “Current practice and recommendations by authors of behavioral research methods texts suggest that IOA [interobserver agreement] be obtained for a minimum of 20% of a study’
sessions, and preferably between 25% and 33% of sessions (Kennedy, 2005; Poling et al., 1995 cited by Cooper et al., 2007, p. 119).” These guidelines were followed in this study.

Interobserver agreement was calculated by dividing the smaller number of recorded instances of the presence of the dependent variables by the larger number of recorded instances for randomly selected sessions and multiplying the result by 100 (Kazdin, 1982) (see Tables 2, 3, and 4). This method gives a frequency ratio. Although this method may produce data that can be perceived as ambiguous by some, according to Kazdin it “...is used relatively often” (p. 52) and is a method that, “...has still proved quite useful (p. 53).” Kazdin explains that a 10-20% margin of error constitutes a demonstration that observers “generally agree” (p.53).
Table 2

Dyad 1 Interobserver Agreement Results for Each Dependent Variable by Participant and Percent of Experimental Conditions

<table>
<thead>
<tr>
<th>Participant</th>
<th>100% of Baseline</th>
<th>26.32% of Intervention</th>
<th>50% of Generalization 1</th>
<th>50% of Generalization 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Range</td>
<td>Mean</td>
<td>Range</td>
</tr>
<tr>
<td>Jon</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scripted</td>
<td>100</td>
<td>97</td>
<td>88.24-100</td>
<td>100</td>
</tr>
<tr>
<td>Unscripted</td>
<td>100</td>
<td>83</td>
<td>0-100</td>
<td>100</td>
</tr>
<tr>
<td>Non-Response</td>
<td>100</td>
<td>91</td>
<td>0-100</td>
<td>100</td>
</tr>
<tr>
<td>Jason</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scripted</td>
<td>100</td>
<td>98.36</td>
<td>94.44-100</td>
<td>100</td>
</tr>
<tr>
<td>Unscripted</td>
<td>100</td>
<td>80</td>
<td>0-100</td>
<td>100</td>
</tr>
<tr>
<td>Non-Response</td>
<td>100</td>
<td>80</td>
<td>0-100</td>
<td>100</td>
</tr>
</tbody>
</table>
Table 3

*Dyad 2 Interobserver Agreement Results for Each Dependent Variable by Participant and Percent of Experimental Conditions*

<table>
<thead>
<tr>
<th>Participant</th>
<th>37.5% of Baseline</th>
<th>32.39% of Intervention</th>
<th>25% of Generalization 1</th>
<th>50% of Generalization 2</th>
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<tr>
<td></td>
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<td>Mean</td>
<td>Range</td>
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<td>Sam</td>
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<tr>
<td>Scripted</td>
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<tr>
<td>Unscripted</td>
<td>83.33</td>
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<td>87.86</td>
<td>33.33-100</td>
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<tr>
<td>Non-Response</td>
<td>100</td>
<td></td>
<td>84.35</td>
<td>0-100</td>
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<td>Abe</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scripted</td>
<td>100</td>
<td></td>
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<td>88.89-100</td>
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<td>50-100</td>
<td>97.75</td>
<td>83.33-100</td>
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<td>Non-Response</td>
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Table 4

*Dyad 3 Interobserver Agreement Results for Each Dependent Variable by Participant and Percent of Experimental Conditions*

<table>
<thead>
<tr>
<th>Participant</th>
<th>100% of Baseline</th>
<th>26.32% of Intervention</th>
<th>50% of Generalization 1</th>
<th>50% of Generalization 2</th>
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<tbody>
<tr>
<td></td>
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<td>Non-Response</td>
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<td></td>
<td>95.45</td>
<td>0-100</td>
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</tr>
<tr>
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<td>83.33-100</td>
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<td>89.77</td>
<td>0-100</td>
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<tr>
<td>Non-Response</td>
<td>100</td>
<td></td>
<td>98.61</td>
<td>66.66-100</td>
</tr>
</tbody>
</table>
Treatment Integrity Assessment

Peterson, Homer, and Wonderlich (1982) state that, "...all statements made concerning the observation of the dependent variable are also applicable to the observation of the dependent variable (p. 479)." Thus, the same principles that guided the generation of IOA data for the measurement of the dependent variable were applied to treatment integrity measures.

Two independent observers (i.e. the investigator and the research assistant) rated randomly selected (by the research assistant) sessions across the entire study for the fidelity with which the independent variable was administered. Each observer rated the number of opportunities and the number of correct administrations for each of the five steps of the procedure. Gresham, et al. (1993) instruct, "...the level of treatment integrity can be obtained by recording the occurrence and non occurrence of the implementation of each treatment component and calculating the percentage of treatment components implemented (p. 262)." This was done when observers noted that treatment components were not administered accurately across phases for each dyad.

Treatment integrity measures for dyad one were taken for 32.39% of overall sessions. Independent raters agreed that in all instances the treatment components were administered with 100% accuracy across baseline and both generalization phases. During the intervention phase, both raters noted that during one session verbal instructions were given to one of the participants. Thus, there is 100% agreement that step five was administered with 94.44% accuracy during the intervention phase.

Treatment integrity measures for dyad 2 were taken for 29.89% of overall sessions. Independent raters agreed that in all instances the treatment components were
administered with 100% accuracy across baseline, intervention, and both generalization phases. Similarly, treatment integrity measures for dyad three were taken for 32.32% of sessions. Independent raters also agreed that in all instances the treatment components were administered with 100% accuracy across baseline, intervention, and both generalization phases.

Analysis of Results

Visual analysis is the means of evaluating data for single-case studies (Cooper, Heron, & Heward, 2007). Graphs have been developed specific to the multiple baseline design that was used (Figures 1 - 6). In the multiple baseline design, “The experimental criterion is met by determining whether performance shifts at each point that the intervention is introduced (Kazdin, 1982, p. 231).” The present study used a multiple baseline across dyads because reciprocation is a shared activity that is interdependent between at least two conversants. As a result, data paths of scripted statements within dyads necessarily mirror one another. Thus, comparisons for questions about scripted statements are made across dyads. Unscripted and non-responses, on the other hand, are more independent behaviors (though still dependent on a previous statement from a conversational partner) and are thus treated separately for each participant.

Research Question One

The first research question was: What are the effects of a script-fading procedure on scripted statements, unscripted statements, and non-responses used by children with autism to reciprocate information to a peer about an object that is in their possession? The first part of this question is answered by noting the shift in performance across dyads.
During baseline only two of the six participants made any scripted statements. During session one for dyad 2 Abe made one scripted statement and during session four for dyad 2 both Sam and Abe made one scripted statement each. Otherwise, all other baselines, for all participants, showed no instances of scripted statements.

During the first intervention session, both participants in dyad one immediately demonstrated a shift in the number of scripted statements made. Jon’s performance shifted from a mean of 0 scripted statements to 15 during his first intervention session. The mean number of scripted statements made by Jon during the intervention phase was 33.47. The other participant in dyad 1 was Jason whose performance shifted from a mean of 0 scripted statements made during baseline conditions to 18 during his first intervention session. The mean number of scripted statements made by Jason during the intervention phase was 33.88.

Later, when the first intervention was introduced to dyad 2 both participants also demonstrated an immediate shift in the number of scripted statements made. Sam’s performance shifted from a mean of 0.125 scripted statements to 15 during his first intervention session. The mean number of scripted statements made by Sam during the intervention phase was 28.12. The other participant in dyad 2 was Abe whose performance shifted from a mean of 0.25 scripted statements made during baseline conditions to 13 during his first intervention session. The mean number of scripted statements made by Abe during the intervention phase was 34.64.

Last, when dyad 3 was first introduced to the intervention after dyads one and two had already begun intervention phases, both participants also demonstrated an immediate shift in the number of scripted statements made. Mort’s performance shifted from a mean
of 0 scripted statements to 10 during his first intervention session. The mean number of scripted statements made by Mort during the intervention phase was 15.92. The other participant in dyad 3 was Dan whose performance shifted from a mean of 0 scripted statements made during baseline conditions to 11 during his first intervention session. The mean number of scripted statements made by Dan during the intervention phase was 16.02.

The stability of the baselines in conjunction with the consistent changes in magnitude across dyads when the intervention is introduced support the conclusion that the intervention was effective in increasing the frequency of scripted statements made by participants. The mean number of scripted statements made by participants moved from a range of 0 – 0.125 scripted statements made during baseline to a range of 15.92 – 34.64 scripted statements made during intervention phases.

Last, it is useful to look at the trend of performance for each dyad during the intervention phase. Both participants in dyads one and three clearly demonstrated an upward trend in the number of scripted statements made during the intervention phase. Dyad two was an exception. Their data show an upward trend for most of the time they were in the intervention phase then began dropping off during session 66.

In order to determine the effect of script fading on unscripted statements used by children with autism to reciprocate information to a peer about an object that is in their possession it is necessary to look at the frequency of unscripted statements made by each participant while script A was being delivered. Means of each participant’s performance are reported in Table 5.
Table 5

Mean Number of Unscripted Statements Made During Baseline and the Presentation of Script A and Change in Means Across Conditions

<table>
<thead>
<tr>
<th>Participant</th>
<th>Baseline</th>
<th>Intervention</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jon</td>
<td>0</td>
<td>1.21</td>
<td>1.21</td>
</tr>
<tr>
<td>Jason</td>
<td>0</td>
<td>1.12</td>
<td>1.12</td>
</tr>
<tr>
<td>Sam</td>
<td>.75</td>
<td>1.67</td>
<td>.92</td>
</tr>
<tr>
<td>Abe</td>
<td>.5</td>
<td>.76</td>
<td>.26</td>
</tr>
<tr>
<td>Mort</td>
<td>1.95</td>
<td>1.08</td>
<td>-.87</td>
</tr>
<tr>
<td>Dan</td>
<td>1.45</td>
<td>1.18</td>
<td>-.27</td>
</tr>
</tbody>
</table>

As shown in Table 5 the mean number of unscripted statements made by participants during baseline never exceeded two statements per three minute session made by any participant during both baseline and intervention sessions. Similarly, the change between means for each participant never exceeds 1.21 for any participant and declined for two of the six participants during the intervention phase. It is also useful to consider the changes of level of actual performance between the last session of the baseline phase and the first session of the intervention phase. These values are reported in Table 6.
Table 6

**Number of Unscripted Statements Made at End of Baseline and Beginning of Intervention**

<table>
<thead>
<tr>
<th>Participant</th>
<th>Baseline</th>
<th>Intervention</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jon</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Jason</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sam</td>
<td>3</td>
<td>0</td>
<td>-3</td>
</tr>
<tr>
<td>Abe</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mort</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dan</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

As shown in Table 6 the immediate change between unscripted statements made during baseline and intervention are unremarkable in all instances. A decrease in performance is also noted for one participant. The low and negative magnitude of these changes does not suggest that script fading has an effect on the frequency of unscripted statements made by the participants. It is also worthwhile to consider the latency between the beginning of intervention and the best performance of each participant.

The highest number of unscripted statements made by participants during the intervention phase while script A was presented was 8 statements made by Jason 12 sessions after the phase had begun. His partner Jon’s best performance was four unscripted statements made during his 18th session of intervention. Similarly, both participants in dyad two demonstrated their peak performance of six unscripted statements each during their 26th intervention session. Last, both participants in dyad
three demonstrated their peak performance of seven unscripted statements made by Mort and five unscripted statements session of intervention. The length of latency between these peak performances and the introduction of the intervention does not provide strong support for a treatment effect.

Finally, an examination of the data paths for unscripted statements in Figures 1 – 6 shows that in each instance only vertical trends are noted. There are a few spikes in the number of unscripted statements made during intervention; however data paths remain relatively stable throughout the phase for each participant. Also overlap between the data paths of unscripted statements made by Mort and Dan during baseline and in intervention is noted. Kazdin (1982) states that, “…data across phases may not overlap (p. 238).” when discussing the Criteria for Visual Inspection (p. 233-239). These data combined in conjunction with those data obtained about the magnitude and rate of change in the number of unscripted statements made by participants does not imply that script fading increases unscripted statements.

In sum, visual analysis of the graphs (Figures 1-6) depicting participant performance on the frequency of dependent measures supports the efficacy of script fading to increase scripted statements made by children with autism to reciprocate information about objects. Visual inspection of the data paths of the frequency of each participant’s unscripted statements during the presentation of script A indicates that there may be a slight effect on increasing frequency. Overall, evidence to support the increase of unscripted statements using script fading is weak and not supported. Also, many of these unscripted statements were off topic; the nature of these unscripted statements should also be taken into account when considering results.
Research Question 2

The second research question was: What are the effects of a script-fading procedure on scripted statements, unscripted statements, and non-responses used by children with autism to reciprocate information to a peer about a picture that is in their possession? Like the first question the first part of this question is answered by noting the shift in performance across dyads. As mentioned earlier during baseline only two of the six participants made any scripted statements. Otherwise, all other baselines for all participants showed no instances of scripted statements.

During the first intervention session with script B both participants in dyad one responded immediately. Jon’s performance shifted from a mean of 0 scripted statements from script B to 22 during his first intervention sessions. The mean number of scripted statements from script B made by Jon during the intervention phase was 27.48. The other participant in dyad 1 was Jason whose performance shifted from a mean of 0 scripted statements from script B made during baseline conditions to 23 during his first intervention session. The overall mean number of scripted statements made by Jason during the intervention phase was 27.91.

When script B was introduced to dyad 2 both participants also demonstrated an immediate shift in the number of scripted statements made. Sam’s performance shifted from a mean of 0.125 scripted statements made during baseline to 10 during his first exposure to script B. The mean number of scripted statements from script B made by Sam during the intervention phase was 20.85. The other participant in dyad 2 was Abe whose performance shifted from a mean of 0.25 scripted statements made during baseline
conditions to 11 during his first intervention session with script B. The mean number of scripted statements from script B made by Abe during the intervention phase was 21.

Last, when dyad 3 was first introduced to script B (see Table 7) after dyads one and two had already begun intervention phases, both participants also demonstrated an immediate shift in the number of scripted statements from script B made. Mort’s performance shifted from a mean of 0 scripted statements to 10 during his first session with script B. The overall mean number of scripted statements from script B made by Mort during the intervention phase was 13.8. The other participant in dyad 3 was Dan whose performance shifted from a mean of 0 scripted statements made during baseline conditions to 10 during his first intervention exposure to script B. The overall mean number of scripted statements from script B made by Dan during the intervention phase was 14.15.

The stability of the baselines in conjunction with the consistent changes in magnitude across dyads when the intervention is introduced support the conclusion that the intervention was effective in increasing the frequency of scripted statements made by participants. The mean number of scripted statements made by participants moved from a range of 0 – 0.125 scripted statements made during baseline to a range of 13.8 - 27.91 scripted statements from script B made during intervention phases. A closer examination of the graphs in Figures 1 - 6 illustrates that in each instance, once script B was introduced, there was an abrupt shift in the number of scripted statements from script B made by participants in each dyad. The consistency and magnitude of these abrupt shifts demonstrate that the treatment effects are also reliable. Further, this immediate response demonstrates that there was no latency of effect once the intervention was introduced;
which provides support for the conclusion that the increase in scripted statements from script B is due to the script fading procedure.

Last, it is useful to look at the trend of performance for each dyad during the intervention phase when script B was presented. All participants clearly demonstrated an upward trend in the number of scripted statements from script B made during the intervention phase providing further support for the efficacy of script B. Taken together with the stability of the baselines compared with the changes in means across phases the evidence suggests that the script fading procedure was responsible for the change in the number of scripted statements made by participants. This conclusion is bolstered by abrupt changes in level and lack of latency between intervention administration and change in behavior. Upward trends in data paths also support an intervention effect.

In order to determine the effect of script fading on unscripted statements used by children with autism to reciprocate information about a picture that is in their possession to a peer, it is necessary to look at the frequency of unscripted statements made by each participant while script B was being delivered only. Each participant’s data will be examined separately. Means of each participant’s performance are reported in Table 7.
Table 7

Mean Number of Unscripted Statements Made During Baseline and During the Presentation of Script B and Change in Means Across Conditions

<table>
<thead>
<tr>
<th>Participant</th>
<th>Baseline</th>
<th>Intervention</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jon</td>
<td>0</td>
<td>.87</td>
<td>.87</td>
</tr>
<tr>
<td>Jason</td>
<td>0</td>
<td>1.43</td>
<td>1.43</td>
</tr>
<tr>
<td>Sam</td>
<td>.75</td>
<td>2.25</td>
<td>1.5</td>
</tr>
<tr>
<td>Abe</td>
<td>.5</td>
<td>1</td>
<td>.5</td>
</tr>
<tr>
<td>Mort</td>
<td>1.95</td>
<td>.5</td>
<td>-1.42</td>
</tr>
<tr>
<td>Dan</td>
<td>1.45</td>
<td>1.15</td>
<td>-.3</td>
</tr>
</tbody>
</table>

As shown in Table 7 the mean number of unscripted statements made by participants during baseline never exceeded 1.95 statements per three minute session. Similarly, the mean number of unscripted statements made by any participant during intervention sessions never exceeded 2.25. Similarly, the change between means for each participant never exceeds 1.5 for any participant and declined for two of the six participants during the intervention phase. It is also useful to consider the changes of level of actual performance between the last session of the baseline phase and the first session of the intervention phase when script B is introduced. These values are reported in Table 8.
As shown in Table 8 the immediate change between unscripted statements made during baseline and at the first introduction of script B is unremarkable in most instances. The highest instance of unscripted statements made during a 3 minute session was Jason who made a mean number of two unscripted statements per minute during the first introduction of script B. During this session Jason also made 23 scripted statements; 3.8 times more scripted statements than unscripted statements. The low magnitude of these changes does not suggest that script fading had an effect on the frequency of unscripted statements about pictures made by the participants.

The highest number of unscripted statements made by participants during the intervention phase while script B was presented was seven statements made by Dan during the 12th session of script B. His partner Mort’s best performance was three
unscripted statements made during his 8th session of exposure to script B. Jon in dyad two demonstrated his peak performance of three unscripted statements each during his 11th session of exposure to script B. His partner Jason demonstrated peak performance of six unscripted statements during his 10th exposure to script B. Last, Sam in dyad two demonstrated his peak performance of six unscripted statements made during his 15th exposure to the presentation of script B. His counterpart Abe demonstrated five unscripted statements, his highest number during presentation of script B, during his 11th exposure to script B. The length of latency between these peak performances and the introduction of the intervention does not provide strong support for a treatment effect.

Finally, an examination of the data paths for unscripted statements in Figures 1 – 6 shows that in each instance only vertical trends are noted and does not deviate from this path regardless of which script is presented. These data combined in conjunction with data obtained about the magnitude and rate of change in the number of unscripted statements made by participants while engaged in scripts revolving around pictures does not imply that script fading increases unscripted statements under this condition.

In sum, visual analysis of the graphs (figures 1-6) depicting participant performance on the frequency of dependent measures supports the efficacy of script fading to produce positive effects on children with autism abilities to reciprocate information about pictures. Visual inspection of the data paths of the frequency of each participant’s unscripted statements during the presentation of script B indicates that in some cases there may be a slight effect on increasing frequency. However, in other cases decreases may be seen. Overall, evidence to support the increase of unscripted statements
using script fading is weak and not supported. The nature of these unscripted statements should also be taken into account when considering results.

Research Question 3

The third research question was: Will children with autism who learn scripts to reciprocate information about an object that is within their possession use that learned reciprocal script to share information about a novel item? When conducting visual inspection, “The experimental criterion is met by determining whether performance shifts at each point that the intervention is introduced (Kazdin, 1982, p. 231).” Because nothing prevented participants from making unscripted statements during the intervention phase about their animals or pictures, to answer this question it is only necessary to compare the performance participants across dyads once they entered the generalization phases to performance in the phase immediately preceding the generalization phase (i.e., the intervention phase).

Comments made by participants that were contextually appropriate were scored as unscripted responses during generalization phases because unscripted reciprocations were previously defined as being contextually appropriate and different from the script. Thus, a comparison is drawn between frequencies of unscripted statements during intervention versus frequency of unscripted statements during the generalization phases. Non responses would also have been measured if they were present during sessions; none were noted. These results are presented in Table 9.
### Table 9

*Mean Number of Unscripted Statements Made During Presentation of Script A and During Generalization Phase I and Change in Means Across Conditions*

<table>
<thead>
<tr>
<th>Participant</th>
<th>Intervention Script A</th>
<th>Generalization Phase I</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jon</td>
<td>1.21</td>
<td>23.75</td>
<td>22.54</td>
</tr>
<tr>
<td>Jason</td>
<td>1.12</td>
<td>24</td>
<td>22.88</td>
</tr>
<tr>
<td>Sam</td>
<td>1.67</td>
<td>24.75</td>
<td>23.08</td>
</tr>
<tr>
<td>Abe</td>
<td>0.76</td>
<td>23.5</td>
<td>22.74</td>
</tr>
<tr>
<td>Mort</td>
<td>1.08</td>
<td>14.5</td>
<td>13.42</td>
</tr>
<tr>
<td>Dan</td>
<td>1.18</td>
<td>16.7</td>
<td>15.57</td>
</tr>
</tbody>
</table>

The table shows that in each case the change in mean number of unscripted statements made during intervention demonstrated noticeable increases from their means during generalization phase I when novel farm animals were introduced in the absence of any written script. Moreover, these statements were all appropriate to the context of the objects that were presented to the participants. While these data provide support for the generalization of conversational skills taught through script fading, this support is further bolstered by examining the magnitude of the level of change at the moment when experimental conditions change. These data are presented in Table 10.
Table 10

Number of Unscripted Statements Made at Last Intervention Session When Script A was Presented and During First Session of Generalization Phase I

<table>
<thead>
<tr>
<th>Participant</th>
<th>Intervention Script A</th>
<th>Generalization Phase I</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jon</td>
<td>0</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Jason</td>
<td>0</td>
<td>29</td>
<td>20</td>
</tr>
<tr>
<td>Sam</td>
<td>0</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>Abe</td>
<td>0</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>Mort</td>
<td>1</td>
<td>18</td>
<td>17</td>
</tr>
<tr>
<td>Dan</td>
<td>2</td>
<td>21</td>
<td>19</td>
</tr>
</tbody>
</table>

As can be seen in Table 10 the shift in the number of unscripted statements made by participants from the last presentation of script A during intervention to generalization phase I was both immediate and abrupt in all instances. Also noteworthy is that in all instances trends of data paths (see Figures 1 – 6) during generalization phase 1 was either moving up (i.e., Abe and Sam) or stabilized (i.e., Jon, Jason, Mort, and Dan).

Research Question 4

The fourth research question was: Will children with autism who learn scripts to reciprocate information about a picture that is within their possession use that learned reciprocal script to share information about a novel picture? This question is answered using the same basis that was used to answer the previous research question. In this
instance participant performance is compared with unscripted statements made during intervention while script B (about pictures) was administered. These data are reported in Tables 11 and 12.

Table 11

Mean Number of Unscripted Statements Made During Presentation of Script B and During Generalization Phase II and Change in Means Across Conditions

<table>
<thead>
<tr>
<th>Participant</th>
<th>Intervention Script B</th>
<th>Generalization Phase II</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jon</td>
<td>.87</td>
<td>22.75</td>
<td>21.88</td>
</tr>
<tr>
<td>Jason</td>
<td>1.43</td>
<td>23.5</td>
<td>22.07</td>
</tr>
<tr>
<td>Sam</td>
<td>2.25</td>
<td>22.25</td>
<td>20</td>
</tr>
<tr>
<td>Abe</td>
<td>1</td>
<td>21.25</td>
<td>20.25</td>
</tr>
<tr>
<td>Mort</td>
<td>.5</td>
<td>13.5</td>
<td>13</td>
</tr>
<tr>
<td>Dan</td>
<td>1.15</td>
<td>14</td>
<td>12.85</td>
</tr>
</tbody>
</table>

Table 11 shows that in each case the change in mean number of unscripted statements made during generalization phase II, when novel pictures were introduced in the absence of any written script, demonstrated noticeable increases from their means during intervention. Moreover, like the statements made during generalization phase I, these statements were also all appropriate to the context of the pictures that were presented to the participants. While these data provide support for the generalization of
conversational skills taught through script fading, this support is further bolstered by examining the magnitude of the level of change at the moment when experimental conditions change. These data are presented in Table 12.

Table 12

Number of Unscripted Statements Made at Last Intervention Session When Script B was Presented and During First Session of Generalization Phase II

<table>
<thead>
<tr>
<th>Participant</th>
<th>Intervention Script B</th>
<th>Generalization Phase II</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jon</td>
<td>0</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>Jason</td>
<td>0</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Sam</td>
<td>0</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Abe</td>
<td>0</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>Mort</td>
<td>1</td>
<td>14</td>
<td>13</td>
</tr>
<tr>
<td>Dan</td>
<td>1</td>
<td>14</td>
<td>13</td>
</tr>
</tbody>
</table>

As can be seen in Table 12 the shift in the number of unscripted statements made by participants from the last presentation of script B during intervention to generalization phase II was both immediate and abrupt in all instances. Also noteworthy is that in all instances trends of data paths (see Figures 1 – 6) during generalization phase II was either moving up (i.e., Jon and Jason) or stabilized (i.e., Sam, Abe, Mort, and Dan).
In summary, each participant clearly demonstrated that they were able to transfer the conversational skills learned from script fading and transfer those skills to conversations about novel pictures. All participants demonstrated noticeable differences in the means of their performances across conditions. These differences were immediate and abrupt. Also, the trend of the participant’s data paths either moves in an upward direction or demonstrated stability. Taken together, the consistency of these results across all participants provides evidence for the effectiveness of script fading to teach conversational skills to children with autism.

Social Validity

At the conclusion of data collection a brief treatment acceptability survey was administered to relevant stakeholders. Those stakeholders include the facility administrator (i.e., school principal), the regular classroom teacher of the participating student from the primary autism class and his assistant, and the classroom assistant of the primary autism class from which a majority of participants came from. The investigator read a brief statement describing the intervention then gave each prospective respondent a survey with a consent letter attached to it. There were four surveys distributed in total and two were returned giving a 50% return rate. Results are shown below in Table 13.
Table 13

*Results of Treatment Acceptability Survey*

<table>
<thead>
<tr>
<th>Question</th>
<th>Respondent 1</th>
<th>Respondent 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>I find this treatment to be an acceptable way of increasing (Child’s name) verbal behavior.</td>
<td>Strongly Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>I would be willing to use this procedure to increase (Child’s name) verbal behavior.</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>I believe that it would be acceptable to use this treatment without children’s consent.</td>
<td>Agree</td>
<td>Neutral</td>
</tr>
<tr>
<td>I like the procedures used in this treatment.</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>I believe this treatment is effective.</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>I believe (Child’s name) will experience discomfort during the treatment.</td>
<td>Strongly Disagree</td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>I believe this treatment is likely to result in permanent improvement.</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>I believe it would be acceptable to use this treatment with individuals who cannot choose treatments for themselves.</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>Overall, I have a positive reaction to this treatment.</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

As shown in Table 13 both respondents had a favorable view of the procedures used. Both respondents also indicated that they would be willing to implement the
intervention themselves. Moreover, both respondents reported that they believed that the intervention would result in permanent improvement for the student.

Summary

Analysis of the magnitude, mean changes across conditions and levels of change, demonstrated that all participating students increased the number of scripted statements made during intervention. The consistent changes in level seen for each student demonstrate the validity of the treatment effect. Analysis of the rate of change across conditions demonstrate that the increases students made in frequency of scripted statements during intervention continued to ascend for each student until the end of intervention. Finally, analysis of the magnitude of change of unscripted statements between intervention and generalization phases demonstrates that students did generalize the learned conversational skills to novel referents. The magnitude of change and the immediacy of change across conditions provide strong support for the conclusion that script fading is an effective means of teaching children with autism to reciprocate information to a peer.
Dyad 1 - Jon

Baseline

Intervention

Fade 1A Fade 2A Fade 3A

A Script A
O Script B
A Unscripted
• Nonresponse

Fade 4A

Fade 5A

Gen. Phase 1

Gen. Phase 2

I 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69

Sessions

Reciprocations
Dyad 3 – Mort

Baseline

Intervention

Fade Step 1A
Fade Step 2A
Fade Step 3A
Fade Step 1B
Fade Step 2B
Fade Step 3B
Fade Step 4B
Fade Step 4A
Fade Step 5A
Fade Step 5B

Sessions

Reciprocations

Diagram showing data points for different phases and steps of an intervention.
Teaching children with autism verbal communication skills is a fundamental component of their individualized programming. One of the strategies that have been developed to teach these skills is a procedure called script fading (Krantz & McClannahan, 1993). The script fading procedure provides written scripts for children with autism to read specific to the context in which the script is presented. As the children become more proficient at reading their script the words are systematically faded in predetermined steps as each predetermined criterion is met.

Script fading has taken two basic forms, audio presentation of scripts (Krantz et al. 1981; MacDuff et al., 2006; Stevenson et al., 2000) and written presentation of scripts (Brown et al., 2007; Charlop-Christy & Kelso, 2003; Ganz et al., 2008; Krantz & McClannahan, 1993, 1998; Ross 2002; Sarokoff et al., 2001). Script fading using an audio presentation of the script is the preferred method for children with autism who cannot read. However, script fading using written prompts is the preferred method of script fading for children with autism who can read. The present study used a written script fading procedure.

Written scripts have been used to teach children with autism a variety of communicative functions such as making initiations to peers (Krantz & McClannahan, 1993), increasing social interaction with adults (Krantz & Mclannahan, 1998), engaging
in conversation about a common stimuli (Sarokoff et al., 2001), reciprocating to gain a
listener’s attention (Ross, 2002), increasing conversational speech ability (Charlop-
Christy & Kelso, 2003; Ganz et al., 2008), and initiating and sustaining conversation. The
present study taught children with autism to reciprocate information to a peer about
objects and pictures.

One of the main concerns with script fading has been the ability to completely
fade the physical prompt (i.e., the script) entirely and transfer stimulus control of the
conversational speech taught to objects and events that occur naturally in the
environment. In the first study in which the term script-fading was coined (Krantz &
McClannahan, 1993), although the procedure was considered successful, participants
continued to check blank pieces of paper as they repeated each line of their script after it
was entirely faded. Since then, several studies have reported that they were able to
completely remove the script (Brown et al., 2007; Charlop-Kristy & Kelso, 2003; Ross,
2002). Similarly, the present study sought to transfer conversations taught to children
with autism using script fading to untrained, novel objects and pictures presented without
scripts.

The previous studies on script fading that have used written scripts have been
conducted in special programs for children with autism except for Ross’ (2002) study
where two of the three participants attended a public school and received training on that
public school campus. However, script fading was applied as part of a package including
cost response which was also under evaluation during the study. Also, one of the three
participants did not attend a public school program. The present study is the first one of
the literature found on script fading to be conducted entirely in a public school. Because
In this chapter the results of the present study, to determine the effects of script fading on children with autism to reciprocate information to their peers about objects and pictures, will be examined. First, findings for each research question examined by this study will be discussed. Second, conclusions that can be drawn from those findings will be enumerated. Third, practical implications of the study's findings will be discussed. Fourth, social validity is discussed. Fifth, limitations to this study's findings are discussed. Last, recommendations for future research in script fading for children with autism will be presented.

Research Question One

Question one was: What are the effects of a script-fading procedure on scripted statements, unscripted statements, and non-responses used by children with autism to reciprocate information to a peer about an object that is in their possession? All participants made noticeable a change in the number of scripted statements they made once scripts were presented. Moreover, in each instance once the script was introduced the change in the number of scripted statements made by participants was immediate (see Figures 1 – 6). This abrupt shift against the background of a stable baseline in each instance depicts an effect of robust magnitude and demonstrates that the effect is reliable.

When examining the trend of performance for each dyad (see Figures 1 – 6) during the intervention phase. Both participants in dyads one and three clearly demonstrated an upward trend in the number of scripted statements made during the
intervention phase. Dyad two was an exception. Their data show an upward trend for most of the time they were in the intervention phase then began dropping off toward the end of the intervention phase. This might be explained by two factors. First, the decrease in the number of scripted statements within this dyad was accompanied by two prolonged absences by Abe, which coupled with weekends, left two six day gaps in exposure to intervention. This time gap may have caused a disruption to the routine of sessions thereby interrupting the momentum the participants had established. On the other hand, this drop in performance may also be accounted for by tedium. Kazdin (1982) notes that, "...if the subject is required to perform special tasks under laboratory-like conditions, repetition of a particular activity... may become tedious (p. 146)." Because the scripts were relatively short, participants had many opportunities to recite the entire script during the three minute sessions. This repetition may have caused tedium that resulted in lower performance. However, toward the end of the study the data path for dyad 2 for scripted statements show that the performance began an upward trend again near the end of the intervention phase.

Also notable was an immediate drop in performance for both participants in dyad 3 at the third fading step for script A. During this session because only the participants’ names and the words "I" was on the scripts they both became confused and began saying, "I blank." Consequently at the beginning of the next session when script A was presented it was necessary to provide brief verbal instructions to participants immediately preceding the intervention session. The investigator modeled the entire script for participants while alternately pointing to their scripts one time. This resulted in two consecutive sessions in which both participants made 10 more scripted statements than
they had in the session immediately preceding. This noticeable change in performance suggests that adding verbal instructions to the procedure may improve the application of script fading.

The effect of the script fading procedure on unscripted statements made by participants while objects were presented was unremarkable in all instances. There were no abrupt changes in frequency and the magnitude and rate of change were unremarkable in all instances between baseline and intervention sessions for all participants. This may be explained by considering that since participants were engaged in a structured conversation the opportunity to make statements other than what was stated in the script is limited. Some examples of the types of unscripted statements that were made by participants included students correcting each other or praising each other for reading the script well, or even teasing. An example is the unscripted statements made by Sam during session 34. In this session Sam attempts to coax Abe into saying, “I have a cow.” when in fact Abe is holding the duck. And during this session Abe says, “You’re not listening.” Though these statements were unscripted statements they were not elaborations of the scripts being taught.

Also notable, was the high number of unscripted statements made by both participants in dyad three during baseline. The initial instability of their baseline performance can be explained by the development of an ongoing disagreement between the participants in this dyad. Some of the unscripted statements made by Mort during baseline sessions were, “I don’t like you.” and, “Stop talking to me.” While Dan was making unscripted statements such as, “Stop being a bully.” and, “Because you hurt my feelings Mort.” While these statements were informative in that they were expressions of
feelings, they were not elaborations on the script. Frequencies of these disagreements during baseline overlap with the data path of the frequency of unscripted statements made during intervention (see Figures 5 – 6); and thus support the conclusion that unscripted statements about objects are not effectively increased through script fading.

In three studies on script fading Krantz and McClannahan (1993; 1998) and Ross (2002) reported that participants in their studies increased the number of scripted statements made and also reported that participants made novel statements that were elaborations of the script that was taught. Sarokoff et al. (2001) also reported that participants increased the frequency of unscripted statements once script fading was implemented with their participants; however, they note no unscripted statements were made by their participants during post intervention assessments. In the present study, unscripted statements were not elaborations of the script and were not significant in number during baseline and intervention phases. Likewise, a recent study conducted by Ganz et al., (2008) also reported that their script fading procedure did not result in an effect on unscripted statements. However, there is a consensus between Brown et al. (2007), Ganz et al., Krantz and McClannahan, Ross (2002), and Sarokoff et al. that script fading is effective in increasing the frequency of scripted statements made by children with autism. Likewise, this study also found that scripted statements made by children with autism increased when script fading was implemented.

Research Question Two

The second research question was: What are the effects of a script-fading procedure on scripted statements, unscripted statements, and non-responses used by children with autism to reciprocate information to a peer about a picture that is in their
possession? The analysis of results regarding this question revealed that in each instance once script B, about pictures, was introduced all participants responded with an increase in the number of scripted statements made about the pictures presented during the script B intervention sessions. In each instance the change was immediate providing evidence that the noted changes are also reliable.

The trend of the data paths for each participant all follows an ascending pattern demonstrating participants' growth in proficiency with the script fading procedure. The most notable increase in performance is seen in dyad one where during the last four sessions of the application of script B both participants demonstrate a rapid and dramatic increase in the number of scripted statements made during the three minute session. This rapid ascension is probably reflective of the increased proficiency of each participant's ability to perform the task of reciting their script. This observed growth can likely be attributed to both of these participants being older than the other participants and having achieved higher reading scores than the other participants.

It is also worthwhile to mention that in all instances the data paths of the frequencies of scripted statements made during script B for each participant was always lower than data paths for frequencies of scripted statements during the application of script A (see Figures 1 – 6). There is overlap between data paths; however, across all participants these paths touch only one time in dyad 1 (see Figures 1 – 2) and never cross each other across all participants. This is likely due to the fact that script A contains more lines, thus, more opportunities.

Visual analysis of the data paths of unscripted statements made during the application of script B (see Figures 1 – 6) revealed that there were no instances of
significant performance. It was concluded that script B did not increase the number of
unscripted statements made by participants. Because conditions were identical during the
application of script A and script B, the only difference being the scripts and the
referents, this lack of effect can also be attributed to the structure of the activity not
lending itself to the generation of unscripted statements. Likewise, noted unscripted
statements were not elaborations of the script. An example is a statement made by Jon to
Jason after Jason reads his line wrong, during an application of script B, Jon says, “No, I
see a flower.” Here Jon is telling Jason verbatim what he is supposed to say.

These findings coincide with previous studies. As mentioned above Krantz and
McClannahan (1993; 1998), Sarokoff et al. (2001), Ross (2002), Brown et al. (2007), and
Ganz et al. (2008) all found that script fading was effective in increasing the number of
scripted statements made by children with autism. This is true even though each study
used a different script fading procedure. This needs to be qualified by noting that some of
the reported script fading procedures were similar such as that used by Sarokoff et al.
which was adapted from Krantz and McClannahan (1993). Likewise this study used a
procedure that was adapted from both Krantz and McClannahn and Sarokoff et al. Thus,
similar findings are not entirely unexpected. There is disagreement, though, about the
effect of script fading on unscripted statements.

As mentioned above while Kranz and McClannahan (1993), Ross (2002), and
Brown et al. (2007) reported that script fading increased unscripted statements made by
participants. Sarokoff et al. (2001) had mixed results reporting an increase of unscripted
statements made by participants during intervention and not during post intervention
assessment sessions. Ganz et al. (2008) found no effect on unscripted statements. The
findings of this study concur with Ganz et al. that though there was a small effect on the number of unscripted statements it was not significant enough to report a useful degree of effect.

**Research Question Three**

The third research question was: Will children with autism who learn scripts to reciprocate information about an object that is within their possession use that learned reciprocal script to share information about a novel item? The differences between unscripted statements made during intervention and during the first generalization phase in which novel plastic farm animals were introduced were remarkable in all instances (see Figures 1 – 6). All participants immediately adapted the learned scripts to similar, novel referents demonstrating that the effect is reliable and consistent. Examples of performance during the first generalization session with similar novel referents are for dyads one and two both Jon and Abe adapts the script from, “I have a duck.” to “I have a pig.” and “My duck is Yellow.” to “My pig is pink.” and “My duck says, ‘Quack.’” to “My pig says, ‘Oink.’” In dyads one and two both participants with the pig changed, “My duck lives on a pond.” to “My pig lives in the mud.” In dyad three Mort stumbled a little and Dan completes his sentence and coaches, “…lives in the mud. Say, ‘lives in the mud.’ They live in the mud. Say, ‘Live in the mud.’”

Also noteworthy was that the trend of data paths on the frequencies of unscripted statements made during generalization phase I for participants in dyads one and three showed a stable performance (see Figures 1 – 2 & 5 – 6). Whereas, the trend of data paths on the frequencies of unscripted statements made during generalization phase I for
participants in dyad two are clearly ascending. This rapid stabilization is likely due to the
comfort level of the participants with engaging in this activity.

These findings are concordant with previous studies. Charlop-Kristy & Kelso (2003) used cue cards to teach scripted statements to children with autism and reported
that they were able to remove the cue cards and that participants continued to make
scripted statements in their absence. Also, Sarokoff et al. (2001) reported that they too
were able to completely remove a written prompt to cue the script they taught by
transferring the discriminative stimulus to an object that naturally occurred in the
environment. Brown et al. (2007) too reported that trained scripts generalized to novel
untrained items found in the natural environment. Likewise, the participants in the
present study demonstrated that they too were able to generalize learned scripts to objects
that are naturally found in their classroom environment. Moreover, similar to the more
recent study by Brown, et al. (2007) this study found that generalization was observed to
have occurred with untrained stimuli.

Research Question 4

The fourth research question was: Will children with autism who learn scripts to
reciprocate information about a picture that is within their possession use that learned
reciprocal script to share information about a novel picture? The differences between
unscripted statements made during intervention and during the second generalization
phase in which novel pictures were introduced were also remarkable in all instances (see
Figures 1 – 6). All participants immediately adapted the learned scripts to similar, novel
pictures demonstrating that the effect is reliable and consistent with pictures as well as
with objects. Typical examples of performances during the first session of generalization
phase II, with novel pictures, are statements made by Jon and Jason. John says, “I see a
dog.” Jason replies, “I see a kite.” This conversation continues until participants
independently decide to switch the pictures and continue the conversation.

Also noteworthy was that the trend of data paths of the frequencies of unscripted
statements made during generalization phase II for participants in all dyads showed a
stable performance (see Figures 1 – 6). This rapid stabilization is also likely due to the
comfort level of the participants with engaging in this activity.

These findings, being similar to the results of analysis of frequency of unscripted
statements made during generalization phase I, are in agreement with previous studies on
script fading. Charlop-Kristy & Kelso (2003), Sarokoff et al. (2001), and Brown et al.
(2007) all reported the ability to completely remove written prompts and associate
outside stimuli as the discriminative stimulus that elicited taught scripts. Likewise the
present study also found that participants were able to generalize scripts taught about a
particular picture to a novel picture in the absence of any written prompts.

Conclusions

There are four distinct conclusions that can be drawn from the results of this
study. The following conclusions are based on the visual analysis of graphs depicting
frequency of statements made by participants during study sessions.

1. Script fading is an effective means of increasing the ability of children with
autism, who attend a special program in a public school, to reciprocate
information to a peer about an object that is within their possession in their
regular classroom.
2. Script fading is not an effective means of teaching children with autism to expand language use through unscripted statements that are elaborations of scripts taught. It can be expected that unscripted statements made during script fading sessions will be off topic or directive in nature.

3. Script fading is an effective means of increasing the ability of children with autism, who attend a public school program for children with autism, to reciprocate information to a peer about a picture that is within their possession in their regular classroom.

4. Script fading is an effective procedure to teach children with autism, who attend a special program in a public school, the general structure of a conversation that can be generalized to novel objects and pictures.

Practical Implications

The benefits to the general practitioner of these findings are remarkable. This study demonstrated that script fading is an effective method of teaching children with autism the conversational skills of reciprocating information to peers about objects and pictures in a general education setting. Testing interventions in general public school settings is important to bear out these interventions for general use. It may be argued by some that interventions that have been developed in the clinical setting may not translate to a natural setting. This study represents a step toward bridging the gap between script fading research for children with autism and its practical application for general classroom use as a research based intervention.
Another practical application of these findings is the practicality of the intervention itself. The intervention used in the present study was specifically designed to be implemented in a general public school program for children with autism. Specifically, it was designed to be easy to implement with materials that were readily available in many public school classrooms for children with autism. The materials necessary to implement this intervention are any plastic objects such as the farm animals that were used in this study. However any plastic objects can be substituted for the farm animals; for example fruits and vegetables can be used. Also, a printer is necessary to create scripts; most teachers have access to a printer somewhere on their school campus.

If script fading using pictures is desired, likewise, pictures of objects and scenes can easily be created and economically printed using current digital technology as was done in this study. For the present study, the investigator used a digital camera to create the pictures used. These pictures were uploaded to the investigators desktop and subsequently to a popular online photo service of a major department store chain. The pictures arrived in the mail within one week.

The procedures used in this study (see Appendix III) were designed to be parsimonious. The procedures used in this study require participants to sit across from one another; the instructor presents written scripts and conversational referents and says, “Talk a lot.” to cue the beginning of the session. If participants do not recite their script the administrator simply uses gestural prompts, pointing, to cue the participant to engage in the activity. These are procedures that can be easily replicated by general practitioners and their assistants with no special training.
Limitations

This study had four limitations that may have had an influence on results. First, this study began at the beginning of a new school year. The class in which the study was conducted served children with autism in grades one and two. Four of the participants, those in dyads two and three, were all first graders. Although some of these participants knew each other prior to entering the class these students, who also became participants in the study, were new to their regular classroom teacher’s class. The regular classroom teacher of the participants was also the investigator. Dyads were formed during the stage when the class was still new and was still establishing rules and routines, and becoming acclimated to each other.

If individual preferences were better understood by the investigator before dyads were formed it would have been unlikely that Mort and Dan would have been paired in a dyad due to the disagreements that developed between them early in the study. Those disagreements caused large spikes in the data paths of unscripted statements made during baseline, due to arguing, that overlap across phases that weakened results.

Second, dyad one consisted of a student in the second grade that spent a majority of the day immersed in a general education class. His communicative partner, Jason, was the oldest participant. Jason was in the fifth grade and also spent some of his day in a resource room; a move toward a less restrictive environment. The other participants were all first graders with no general education exposure save for daily specials and lunch. Although the results of the participants in dyad one are comparable to the results of the participants in dyads two and three; these participants themselves might not be comparable to one another.
Third, because this study occurred in a public school setting there were
distractions during some of the study sessions. Some of these distractions included
ringing phones, people entering the room unexpectedly, other special needs children
making loud noises that distracted participants, fire alarm drills, and announcements over
the school intercom system. These distractions would have caused lower performances
during the sessions in which they occurred.

Last, within dyad one Jon was absent 15 full days and two half days during the
time when he was participating in the study. Of those 15 absences twice he was absent
for four consecutive days, with a weekend in between, that were immediately preceded
by a half day absence. Similarly, Abe in dyad two was also absent 15 full days and two
half days during the time when he was participating in the study. Of those 15 absences
there was one episode in which he had seven consecutive absences with two weekends in
between. These absences may have retarded performance due to lack of opportunity.

Social Validity

Social validity measures were taken through a survey that was distributed to
relevant stakeholders. Those stakeholders were the facility administrator, the regular
teacher of the participating student from the intermediate autism class at the school, his
assistant, and the primary autism classroom teaching assistant. A 50% return rate was
realized. The first respondent answered strongly agree to all statements except for item
three which they rated as neutral and item six which they rated as strongly disagree. The
second respondent rated item one as strongly agree, items two through five as agree, item
six as strongly disagree, items seven through nine as agree.
There was neutral response to item six which asked about using the procedure without the student's consent. However, this respondent did indicate that they would be willing to use this intervention by stating strongly agree. The same respondent also indicated that they strongly believed that the intervention would not result in student discomfort and they strongly agreed that it would be okay to use this treatment for those who cannot choose for themselves.

Both respondents gave positive feedback regarding the acceptability of the treatment and their willingness to implement the procedures used in this study to increase verbal behavior for children with autism. Both respondents also indicated that they had an overall positive reaction to the treatment thus indicating that this treatment would be acceptable to apply in this venue.

Recommendations

Based on the findings of this study it would be productive for future researchers to examine the addition of verbal instructions when necessary to the procedures. Verbal instructions were not included in the procedures in order to facilitate generalization and to reduce prompt dependency. It was found that at some points during the study it was necessary to deliver verbal directions to cue participants to comply with session expectations like reading louder or to end argumentative disagreements between participants. It was also necessary at one time to model the expected response to participants in dyad three after they became confused at a fading step. Their responses during the next two sessions were among the highest frequencies of any sessions during the entire study. Thus, it would be productive to test whether the intervention would be
just as effective in achieving generalized results with the addition of calculated verbal instructions being allowed.

Also, the scripts taught in this study were brief consisting of four and three statements per participant before participants switched objects or pictures and recited the script again. After a short period, participants had memorized their scripts and were able to repeat the entire sequence many times during a session. Future research on script fading for children with autism should be designed to examine whether or not the same results that were obtained by the present study could be replicated with longer scripts.

This study was conducted with children with autism who were all in elementary school. This study should be replicated with students with autism in both middle and high schools to determine if script fading is an effective communication intervention for older children with autism.

Last, this study demonstrated that two scripts could be taught simultaneously using script fading. However, during generalization phases participants remained constrained by the structure of the scripts that were taught. Generally, participants repeated the same script for the same number of turns while substituting the attributes of the novel objects and pictures. Future research should attempt to teach two or more scripts simultaneously that can be scaffolded to create more natural conversations that wind through various topics.
TITLE OF STUDY: Effects of Script Fading on the Abilities of Children with Autism to Reciprocate Information

INVESTIGATOR(S): Tom Pierce, P.h. D. and Marc Tedoff, M.S. Ed.

CONTACT PHONE NUMBER: Dr. Pierce (702) 895-3205

Purpose of the Study
Your child has been invited to participate in a research study. The purpose of this study is to determine the effects of script fading on the abilities of children with autism to reciprocate, or share, information about objects and pictures. Script fading is a teaching method that uses written words or sentences to prompt children to say the right things at the right time. Once a student becomes good at reading their script, the script is faded by removing some words. This continues until the child can say the script without the paper in front of them. This teaching method has been successfully used to teach children with autism to engage in social exchanges and conversational speech. This study will examine if the procedure will work to teach children with autism to share information about objects and pictures.

Participants
In order to participate in this study your child must have minimal reading and language skills. To find out if your child meets these criteria standardized tests will be given to your child. The results of these tests will be available for your review.

Procedures
If you give permission for your child to participate in this study, your child will first be tested using the Woodcock-Johnson-III Letter-Word Identification and the Passage Comprehension subtests. Also, the Expressive One-Word Picture Vocabulary Test, and the Receptive One-Word Picture Vocabulary Test will also be given by a speech pathologist. Those results will be given to you and discussed with you if you want.

Benefits of Participation
There may be direct benefits to your child for being tested. Additional information about your child’s ability levels in reading and language may lead to a better understanding of your child’s development in reading and language.

Risks of Participation
There are risks involved in all research studies. This study may include only minimal risks. There is always a risk that confidential information may be exposed by accident. However, tightly controlled procedures and policies will help to significantly reduce this risk.
PARENT PERMISSION TO SCREEN
Department of Special Education

TITLE OF STUDY: Effects of Script Fading on the Abilities of Children with Autism to Reciprocate Information

INVESTIGATOR(S): Tom Pierce, P.h. D. and Marc Tedoff, M.S. Ed.

CONTACT PHONE NUMBER: Dr. Pierce (702) 895-3205

Cost / Compensation
There will not be financial cost to you to participate in this study. It may take up to one hour to give all four of the screening tests. Your child will not be compensated for their time.

Contact Information
If you have any questions or concerns about the screening process, you may contact Dr. Tom Pierce or Marc Tedoff at (702) 895-3205. For questions regarding the rights of research subjects, any complaints or comments regarding the manner in which the study is being conducted you may contact the UNLV Office for the Protection of Research Subjects at 702-895-2794.

Voluntary Participation
Your child's participation in this study is voluntary. You may refuse to allow your child to participate in this study or in any part of this study. You may withdraw your permission at any time without prejudice to your relations with your child's school, class, or the university. You are encouraged to ask questions about this study at the beginning or any time during the research study. Your child will not miss any instructional time if you choose not to have him participate.

Confidentiality
All information gathered in this study will be kept completely confidential. No reference will be made in written or oral materials that could link you or your child to this study. All records will be stored in a locked facility at UNLV for at least 3 years after completion of the study. After the storage time the information gathered will be destroyed.
TITLE OF STUDY: Effects of Script Fading on the Abilities of Children with Autism to Reciprocate Information

INVESTIGATOR(S): Tom Pierce, Ph.D. and Marc Tedoff, M.S. Ed.

CONTACT PHONE NUMBER: Dr. Pierce (702) 895-3205

Participant Permission:
I have read the above information and agree to allow my child to be screened for participation in this study. I am at least 18 years of age. A copy of this form has been given to me.

Signature of participant’s parent ________________________________ Date ______________

Signature of participant’s parent ________________________________

Participant Name (Please Print) ________________________________

Participant Note: Please do not sign this document if the Approval Stamp is missing or is expired.
TITLE OF STUDY: Effects of Script Fading on the Abilities of Children with Autism to Reciprocate Information

INVESTIGATOR(S): Tom Pierce, P.h. D. and Marc Tedoff, M.S. Ed.

CONTACT PHONE NUMBER: Dr. Pierce (702) 895-3205

Purpose of the Study
Your child has been invited to participate in a research study. The purpose of this study is to determine the effects of script fading on the abilities of children with autism to reciprocate, or share, information about objects and pictures. Script fading is a teaching method that uses written words or sentences to prompt children to say the right things at the right time. Once a student becomes good at reading their script, the script is faded by removing some words. This continues until the child can say the script without the paper in front of them. This teaching method has been successfully used to teach children with autism to engage in social exchanges and conversational speech. This study will examine if the procedure will work to teach children with autism to share information about objects and pictures.

Participants
Your child is being asked to participate in the study because s/he is currently enrolled in an elementary school program for children with autism and they have demonstrated the minimum necessary reading, expressive language, and receptive language skills necessary to benefit from the teaching method that will be used in the study.

Procedures
If you volunteer for your child to participate in this study, your child will be asked to do the following: First they will be taught to read the lines of their scripts using verbal praise. They will also be taught to identify objects in pictures. Once your child can do these things they will participate in two sessions per day each lasting for three minutes. During these sessions your child will be seated at a table with another student and the Student Investigator (Marc Tedoff). Your child will be given a plastic farm animal or a picture and their script. Your child will be prompted to read their script. These sessions will be videotaped so that data can be collected after the sessions. Only one mini DV tape will be used throughout the study. The videotaped sessions will be transferred daily to a DVD. These DVDs will be the only copy of the videotaped session. The mini-DV will be unwound and destroyed at the conclusion of the study. All DVDs will be secured in a locked cabinet in the Primary investigator's office for a period of three years and one day, at which point all records and recorded material from the study will be destroyed by cutting or shredding and will be properly disposed of. Normal instructional activities for the class will continue while these sessions are going on. The classroom aids will continue with the daily routine under the supervision of the classroom teacher.
TITLE OF STUDY: Effects of Script Fading on the Abilities of Children with Autism to Reciprocate Information

INVESTIGATOR(S): Tom Pierce, Ph.D. and Marc Tedoff, M.S. Ed.

CONTACT PHONE NUMBER: Dr. Pierce (702) 895-3205

Benefits of Participation
There may be direct benefits to your child as a participant in this study. Your child may learn to share information about objects and pictures that they have in their hand. Also, we hope to learn about quality ways to teach children with autism to share information using a teaching method that is easy for a teacher to use.

Risks of Participation
There are risks involved in all research studies. This study may include only minimal risks.

Cost/Compensation
There will not be financial cost to you to participate in this study. The study will take approximately 6 minutes of your child’s time per day for up to 45 school days (two months). Your child will not be compensated for their time.

Contact Information
If you have any questions or concerns about the study, you may contact Dr. Tom Pierce or Marc Tedoff at (702) 895-3205. For questions regarding the rights of research subjects, any complaints or comments regarding the manner in which the study is being conducted you may contact the UNLV Office for the Protection of Research Subjects at 702-895-2794.

Voluntary Participation
Your child’s participation in this study is voluntary. You may refuse to allow your child to participate in this study or in any part of this study. You may withdraw your permission at any time without prejudice to your relations with your child’s school, class, or the university. You are encouraged to ask questions about this study at the beginning or any time during the research study. Your child will not miss any instructional time if you choose not to have him participate.

Confidentiality
All information gathered in this study will be kept completely confidential. No reference will be made in written or oral materials that could link you or your child to this study. All records will be stored in a locked facility at UNLV for at least 3 years after completion of the study. After the storage time the information gathered will be destroyed.
TITLE OF STUDY: Effects of Script Fading on the Abilities of Children with Autism to Reciprocate Information
INVESTIGATOR(S): Tom Pierce, Ph. D. and Marc Tedoff, M.S. Ed.
CONTACT PHONE NUMBER: Dr. Pierce (702) 895-3205

Parent Permission:
I have read the above information and agree to allow my child to participate in this study. I am at least 18 years of age. A copy of this form has been given to me.

________________________________________________________________________
Signature of participant's parent Date

________________________________________________________________________
Signature of participant's parent

________________________________________________________________________
Participant Name (Please Print)
TITLE OF STUDY: Effects of Script Fading on the Abilities of Children with Autism to Reciprocate Information
INVESTIGATOR(S): Tom Pierce, P.h. D. and Marc Tedoff, M.S. Ed.
CONTACT PHONE NUMBER: Dr. Pierce (702) 895-3205

I agree to allow my child to be videotaped during training and response opportunity sessions for the purpose of this research study.

Signature of participant’s parent __________________________ Date ______________

Signature of participant’s parent __________________________

Participant Name (Please Print) __________________________

Participant Note: Please do not sign this document if the Approval Stamp is missing or is expired.
RECEIVED

OFFICE FOR THE PROTECTION OF RESEARCH SUBJECTS

APR 11 2008

APPENDIX M

(TREATMENT EVALUATION CONSENT FORM)

DEAR COLLEAGUE,

THIS LETTER IS BEING GIVEN TO YOU IN ORDER TO ASK FOR YOUR
PARTICIPATION IN THE STUDY EFFECTS OF SCRIPT FADING ON THE
ABILITIES OF CHILDREN WITH AUTISM TO RECIPROCATE INFORMATION. AT
THE END OF THE STUDY I WOULD LIKE TO READ A DESCRIPTION OF THE
PROCEDURES USED IN THE STUDY AND THEN ASK YOU TO COMPLETE A
SHORT ONE PAGE SURVEY ABOUT HOW YOU FEEL ABOUT THOSE
PROCEDURES AND THEIR APPROPRIATENESS FOR USE IN SCHOOL WITH
STUDENTS WITH AUTISM IN YOUR SCHOOL.

THE PURPOSE OF THIS STUDY IS TO DETERMINE THE EFFECTS OF SCRIPT
FADING ON THE ABILITIES OF CHILDREN WITH AUTISM TO RECIPROCATE
INFORMATION ABOUT OBJECTS AND PICTURES. SCRIPT FADING IS A
TEACHING METHOD THAT USES WRITTEN WORDS OR SENTENCES TO
PROMPT CHILDREN TO SAY THE RIGHT THING AT THE RIGHT TIME. ONCE A
STUDENT BECOMES GOOD AT READING THEIR SCRIPT, THE SCRIPT IS
FADED BY REMOVING SOME WORDS. THIS CONTINUES UNTIL THE
STUDENT CAN SAY THE SCRIPT WITHOUT A WRITTEN PROMPT.

YOU ARE BEING ASKED TO PARTICIPATE IN THIS STUDY BY PROVIDING
YOUR OPINION ON THE PROCEDURES USED IN THE STUDY. YOUR
ANONYMOUS OPINION WILL BE CONSIDERED WHEN AN ANALYSIS OF THE
PROCEDURE IS MADE.

THERE MAY BE NO DIRECT BENEFIT TO YOU FOR PARTICIPATING IN THIS
STUDY. HOWEVER, THE FIELD OF AUTISM INTERVENTION MAY BENEFIT
FROM YOUR PARTICIPATION. THERE ARE RISKS INVOLVED IN ALL
RESEARCH STUDIES. THIS STUDY MAY INVOLVE ONLY MINIMAL RISKS
INCLUDING THE ACCIDENTAL DISCLOSURE OF YOUR IDENTITY. ALL
INFORMATION COLLECTED IN THIS STUDY WILL BE KEPT CONFIDENTIAL.
DUE DILIGENCE PROCEDURES WILL BE USED TO INSURE THE
ANONYMITY OF YOUR PARTICIPATION.

THERE WILL BE NO FINANCIAL COST TO YOU FOR PARTICIPATING IN THIS
STUDY. ALSO, NO COMPENSATION WILL BE OFFERED FOR YOUR
PARTICIPATION. YOUR PARTICIPATION IN THIS STUDY IS VOLUNTARY
AND YOU MAY WITHDRAW YOUR PARTICIPATION AT ANYTIME YOU
WANT TO.

IF YOU HAVE ANY QUESTIONS OR CONCERNS ABOUT THE STUDY, YOU
MAY CONTACT DR. TOM PIERCE OR MARC TEDOFF AT (702) 895-3205. FOR
QUESTIONS REGARDING THE RIGHTS OF RESEARCH SUBJECTS, ANY
COMPLAINTS OR COMMENTS REGARDING THE MANNER IN WHICH THE
STUDY IS BEING CONDUCTED YOU MAY CONTACT THE UNLV OFFICE FOR
THE PROTECTION OF RESEARCH SUBJECTS AT 702-895-2794.

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SINCERELY,

MARC TEDOFF
APPENDIX II

LETTERS
Dear Parents,

Your child is being invited to participate in a research study that will be conducted in their regular classroom. The goal of this project is to teach young children with autism to talk about objects and pictures with other children. Participation in this study will take up to ten minutes of your child’s time each day for between 20 and 40 days.

If you choose to have your child participate I will explain all of the details of the project to your satisfaction at a time that is convenient to you. You will also be able to ask any questions you may have before you give your permission for your child to participate.

You are under no obligation to give permission for your child’s participation. If you do not give permission it will have no impact on your child’s regular educational program. You may decide at anytime during the study that you no longer want your child to participate. Your child will not be penalized in any way or miss any instructional time as a result of declining to participate in this study. Instructional activities based on your child’s IEP and the Clark County School District Curriculum Essential Framework will continue to be administered by classroom staff while individual students are participating in the study activities.

The primary investigator for this study is Dr. Tom Pierce from the Department of Special Education at the University of Nevada Las Vegas; the student investigator is Marc Tedoff. If you have questions you may call Dr. Pierce at (702) 895-3205 or Marc Tedoff at (702) 496-1367.

Please check one and return in your child’s book bag:

[ ] I am interested in learning more about this study please contact me. The best time to reach me is: ________________________________.

[ ] No thank you, I do not want my child to participate in this study.

Thank you for considering your child’s participation in this study.

Sincerely,

Marc Tedoff
Dear Parents,

Thank you for allowing me to assess your child's reading and language skills to determine their ability to benefit from participation in the study titled: Effects of Script Fading on the Abilities of Children with Autism to Reciprocate Information.

As you may already know, children with autism display a wide range of ability in all developmental areas that may be above or below the norm for their age. Based on your child's current skill level in reading and/or language, participation in this study may not be the best use of instructional time for your child at this time.

I want to thank you again for considering your child's participation in this study and take the opportunity to assure you that your child's participation in this study probably would not benefit them at this time. If you have any questions and/or would like to learn more about your child's performance on the screening tests we used, please do not hesitate to contact either Dr. Pierce at (702) 895-3205 or Marc Tedoff at (702) 496-1367.

Sincerely,

Marc Tedoff
APPENDIX III

DATA COLLECTION FORMS
Data Collection Form

Effects of Script Fading on the Abilities of Children with Autism to Reciprocate Information

Session/Video Clip Identifier: ____________ Rater Initials: ____________ Date: ____________

Participant Identifier: ____________ Script Identifier: A / B

<table>
<thead>
<tr>
<th>Dependent Measures</th>
<th>Total number of occurrences during session</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scripted Reciprocations</strong> - Statements that match the written script exactly or with the exception that, conjunctions, articles, prepositions, or pronouns could be altered or deleted (e.g., substituting “the” for “my,” or dropping “the”), and verb tense could be changed, thus a participant could say, “saw” instead of “see.” <strong>Do not score if student is initiating.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Unscripted Reciprocations</strong> – Statements that are contextually appropriate but differs from the script by more than conjunctions, articles, prepositions, pronouns, or changes in verb tense. An example would be, “I like my cow.” <strong>Do not score if student is initiating.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Non-response</strong> - Any utterance (word, phrase, or sentence) that was not prompted by the Student Investigator and that occurs within 5 seconds of a statement from the participant’s communicative partner, and is contextually inappropriate. An example would be a delayed echolalic statement, or a statement about an object or activity that is not within the possession of the participant at the moment when the statement is uttered.</td>
<td></td>
</tr>
</tbody>
</table>

Total number of occurrences during session: 142
Treatment Integrity Data Form

Treatment Integrity Data Form adapted from Van Norman (as cited in Cooper, Heron, & Heward, 2007) for:

Effects of Script Fading on the Abilities of Children with Autism to Reciprocate Information

Session/Video Clip Identifier: __________ Rate Initials: _______ Date: _______

<table>
<thead>
<tr>
<th>Procedural Steps</th>
<th>Opportunities</th>
<th>Correct</th>
<th>% Correct</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Participants are seated directly across from each other; Student Investigator (SI) is seated adjacent to participants.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Participants each receive a plastic farm animal or picture.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Participants each receive their script.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. A verbal instruction, “Talk a lot” is delivered by the SI.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. The SI uses gestural prompts to encourage participants to speak their script in turn. No verbal instructions are provided.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX IV

TREATMENT EVALUATION FORM
Please complete the items listed below by placing a checkmark on the line under each question that best indicates how you feel about Script Training with Systematic Fading for teaching reciprocal conversational skills to children with autism. Please read the items very carefully because a checkmark accidentally placed on one space rather than another may not represent the meaning you intended.

1. I find this treatment to be an acceptable way of increasing (Child's name) verbal behavior.
   Strongly Disagree  Disagree  Neutral  Agree  Strongly Agree

2. I would be willing to use this procedure to increase (Child’s name) verbal behavior.
   Strongly Disagree  Disagree  Neutral  Agree  Strongly Agree

3. I believe that it would be acceptable to use this treatment without children's consent.
   Strongly Disagree  Disagree  Neutral  Agree  Strongly Agree

4. I like the procedures used in this treatment.
   Strongly Disagree  Disagree  Neutral  Agree  Strongly Agree

5. I believe this treatment is effective.
   Strongly Disagree  Disagree  Neutral  Agree  Strongly Agree

6. I believe (Child’s name) will experience discomfort during the treatment.
   Strongly Disagree  Disagree  Neutral  Agree  Strongly Agree

7. I believe this treatment is likely to result in permanent improvement.
   Strongly Disagree  Disagree  Neutral  Agree  Strongly Agree

8. I believe it would be acceptable to use this treatment with individuals who cannot choose treatments for themselves.
   Strongly Disagree  Disagree  Neutral  Agree  Strongly Agree

9. Overall, I have a positive reaction to this treatment.
   Strongly Disagree  Disagree  Neutral  Agree  Strongly Agree
REFERENCES


VITA

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Dissertation Title: Effects of Script Fading on the Abilities of Children with Autism to Reciprocate Information

Dissertation Examination Committee:
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Committee Member, Dr. Susan Miller, Ph.D.
Committee Member, Dr. David Grant, Ph.D.
Graduate Faculty Representative, Dr. Randy Astramovich, Ph.D.