MANDING FOR INFORMATION MAINTAINED BY SOCIAL REINFORCEMENT:
A COMPARISON OF PROMPTING PROCEDURES

by

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Abstract

Manding for information maintained by social reinforcement (i.e., another person answering a question posed by the speaker) may help improve the social skills of individuals with autism. In the present study, an adapted alternating treatments design was implemented to compare the efficacy of echoic and textual prompts to teach three students with autism (ages 8-15) to ask questions related to a pre-selected topic of conversation (i.e., food, games, school). Participants were first required to answer questions related to the three topics to determine if accurate responses were within their repertoire. This was followed by exposure to both textual and echoic prompts with a prompt delay to ask relevant questions to the experimenter. Generalization probes were then conducted with a peer, and follow-up probes were conducted at two and three weeks following training. Results indicate echoic prompts resulted in learning with fewer trials to criterion across all participants. Limitations and implications for future studies are discussed.

Keywords: prompt comparison, mands, autism, spontaneous communication
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Manding for Information Maintained by Social Reinforcement:

A Comparison of Prompting Procedures

Pervasive Developmental Disorders (PDD) “are characterized by severe and pervasive impairment in several areas of development including: reciprocal social interaction skills, communication skills, or the presence of stereotyped behaviors, interests, and activities” (Diagnostic and Statistical Manual of Mental Disorder, 2000, Fourth Edition, Text Revision; DSM-IV-TR). There are five disorders that currently fall under the category of PDD: Autistic Disorder, Rett’s Disorder, Childhood Disintegrative Disorder, Asperger’s Disorder, and Pervasive Developmental Disorder Not Otherwise Specified. Characteristics of these disorders are frequently evident within the first few years of life.

Prevalence of Delayed Language Development

Children with autism usually cannot use their full language capabilities to communicate (Carr & Kologinsky, 1983). According to statistics from the Center for Disease Control (2009), about 40% of children with Autism Spectrum Disorders (ASD) have no speech, and 25 to 30% of children with ASD have acquired a number of words at 12 to 18 months of age but then lose them. Rice, Warren, and Betts (2005) indicated that up to 20% of 9 year-old children with autism used five words or less and were considered nonverbal, while 67% of children with autism had mixed delays in receptive and expressive language. Children with autism not only show delays and impairments in expressive and receptive language, but also in other areas such as repetitive speech, nonsensical speech, and well developed non-utilized speech (Cook, 2009).
Developed non-utilized speech is one of the many challenges associated with ASD. Many individuals diagnosed with autism are said to lack spontaneous interaction, and are thus prompt dependent, which may account for the non-utilized vocal repertoires (Duffy & Healy, 2011). Communication allows an individual to gain control over his/her environment and live a more independent life (Duffy & Healy, 2011). Thus, the development of methods to improve and maintain spontaneous communication in children with autism remains an important research focus.

There is a general agreement among professionals regarding the importance of spontaneous communication, but it has not been defined consistently throughout literature. For the purpose of this paper, a general definition of spontaneous communication is: a communicative behavior in the absence of prompts, instructions, and other verbal discriminative stimuli (Duffy & Healy, 2011).

**Interventions to Increase Spontaneous Communication**

Over the years many treatment interventions have been designed to increase spontaneous communication, particularly in children with ASD. Interventions such as script fading, time delay procedures, discrete trial training, fluency training, peer-mediated interventions, and modeling have all displayed positive results to various degrees. Despite the vast array of treatment options available, the one factor that has led to consistent treatment success has been early and intensive intervention (Corsello, 2005; Woods & Wetherby, 2003). When the intervention and intensity are similar, children who begin intervention before age four have shown greater progress than older children who engaged in the same interventions (Rogers, 1996). Rogers indicated that children who received 25 hr or more per week of behavior analytic intervention between the ages of
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one to three had higher IQ scores at age 7-8, than children receiving only 5 hr of the same services.

No one single intervention will remain consistently superior for establishing or increasing spontaneous communication. The effects of an intervention depend mostly on the individual. A wide variety of interventions displayed in peer-reviewed literature have been utilized with success. An exhaustive literature review is beyond the scope of this paper, but a description of the most prevalent will be provided.

**Discrete Trial Training.** Discrete trial training (DTT) is a highly structured approach that has been successfully utilized to teach spontaneous communication with a focus on teaching individuals to become fluent respondents through one-to-one mass trial instruction (Duffy & Healy, 2011). A discrete trial is a small unit of instruction, lasting only a few seconds, which can be implemented by a wide range of people including teachers, therapists, and family members. A discrete trial includes five parts: 1) presentation of a cue or discriminative stimulus (e.g., “What is this?”); 2) a prompt, generally given after the cue, to assist with responding appropriately to the cue (e.g., “It’s a cow.”); 3) a response or answer to the cue; 4) a consequence, which may be in the form of reinforcement following correct responses or additional prompting following incorrect responses; and 5) intertrial intervals, a brief delay inserted before presenting the next cue (Smith, 2001). Procedures such as differential reinforcement, modeling, prompt delays and prompt fading techniques are often used in conjunction with DTT to teach spontaneous communications (Duffy & Healy, 2011; Smith, 2001).

Jones, Feeley and Takacs (2007) examined the effectiveness of DTT, prompting, and error correction procedures to teach young children (i.e., 3 years of age) spontaneous
communicative responses. The responses included saying “Bless you” when someone sneezed, resulting with the sneezer saying “Thank you,” asking “What?” when someone whispered, and asking “Are you okay?” after someone grabbed a body appendage and verbally indicated they were in pain. No responding occurred for either participant during the baseline phase, and spontaneous communication in the specified response form improved quickly following implementation of the intervention.

Similarly, Devlin & Harber (2004) evaluated the effects of DTT across locations (home and school) with a 5-year-old boy diagnosed with autism. Teachers, family members, and therapists were all trained to provide 20-24 hours of DTT per week to improve receptive and expressive language, conversation, and sentences. Results indicated that DTT training improved beginning skill curriculum of receptive and expressive language from pre- to post- tests by 58% and 43%, respectively. Intermediate skills were also improved from pre- to post- tests by 11% and 26%. These results indicate that DTT can be utilized to improve expressive and receptive language in children diagnosed with autism.

In a more recent study, Downs, Downs, Fossum, and Rau (2008) evaluated the effectiveness of DTT on three children diagnosed with autism who had significant cognitive and language delays (e.g., conversation skills, turn taking, identifying objects, shapes, colors, and emotions). Each DTT unit lasted 3-10 s. During the first year of the study, students received 10-15 min of DTT three times per day. During year two, students received one 30-45 min session of DTT per day. Results indicated that students mastered a total of 167-362 combined new skills in both years of the study as a result of DTT.
Collectively, these results indicate that DTT may be an effective approach in teaching communication skills to children diagnosed with autism.

Critics of DTT argue that this form of instruction may lead to passivity, and account for deficits in communicative spontaneity (Duffy & Healy, 2011; Woods & Weatherby, 2003). Critics also suggest that making the spontaneous communication procedures as similar to the natural environment as possible may increase spontaneity.

**Natural Learning Programs.** An intervention formed in the 1980’s may address many of the critic’s issues with DTT. This intervention has been referred to as milieu therapy, milieu language training or incidental teaching (Duffy & Healy, 2011). In this approach, teaching occurs in the natural environment where the learner’s interests control the teaching platform for communicative exchanges. These procedures have displayed positive results in increasing vocabulary, maintaining communicative skills, and facilitating unprompted language. However, the techniques used varied greatly between studies and it is unclear which components were responsible for the increased spontaneity (Duffy & Healy, 2011). Few studies have compared DTT training to naturalistic behavior approaches, but results generally indicate that naturalistic approaches yield larger language gains than DTT (as cited in Woods & Weatherby, 2003). As of 2001, the National Research Council (NCR) also concluded that naturalistic approaches were the most effective treatment in regards to social and communication skill acquisition (Woods & Weatherby, 2003). Contrary to similar research efforts, Goldstein (2002) made the argument that milieu treatment may reduce the need to program for generalization, but there is little evidence indicating which method is more effective for increasing spontaneous communication.
**Prompt Delay Procedure.** Another technique commonly used in both DTT and milieu therapy is a prompt delay. Schuster, Gast and Wolery (1988) describe a prompt delay procedure as a method for transferring stimulus control from a controlling stimulus to a naturally occurring stimulus. For example, a person’s sneeze is a natural stimulus for a response of “Bless you”; on the other hand, if a mother has to prompt her child after a person sneezes (e.g., “What do you say?”), the prompt in this case would be the stimulus controlling the child’s “Bless you” response. In the prompt delay procedure, stimulus control is transferred from a controlling stimulus to a natural stimulus by immediately presenting the controlling stimulus, such as a prompt with a zero-second delay, after the occurrence of the natural stimulus, such as a sneeze. Over successive trials, time is systematically increased between the sneeze and the prompt. The time between the sneeze and the prompt provides the individual with an opportunity to respond to the sneeze independently. The delay between the natural and controlling stimulus systematically increases until stimulus control is transferred from the controlling stimulus to the natural stimulus.

Multiple research studies have successfully utilized a time delay procedure to increase spontaneous speech (Charlop & Trasowech, 1991; Ingenmey & Van Houten, 1991; Matson, Sevin, Fridley, & Love, 1990; Schuster et al., 1988). Ingenmey and Van Houten (1991) used a prompt delay procedure to investigate the effect of inducing spontaneous speech in a 10-year-old male with autism during play activities. Following the completion of one of the target play behaviors (playing with toy cars and drawing), the experimenter asked the participant to describe his behavior (e.g., “What did you make?” or “Why did you park the car?”). The participant was taught to respond
appropriately by saying,” I made a _____.” and “Car needs____.” In the baseline phase, spontaneous speech varied between six to 25% of car play trials and only one occurrence in drawing trials. After the prompt delay procedure was introduced, spontaneous speech immediately increased and was maintained at very high levels (near 90%) in both trial types.

Matson and colleagues (1990) also studied spontaneous verbal responding in three participants using a prompt delay procedure. Three responses (“please,” “thank you,” and “you’re welcome”) were targeted in this study. Significant gains across three spontaneous verbal behaviors were noted in the results for all participants. This procedure has also been used to increase spontaneous speech in a naturally occurring setting (Charlop & Trasowech, 1991). In this study, parents of three children with autism were taught to implement a prompt delay procedure to increase spontaneous responses. For example, a child would say, “Good morning, Mom,” at the first interaction of the day in the child’s room. Spontaneous speech was low during baseline, but was quickly acquired and maintained at high levels after implementation of the time delay procedure for all three participants.

**Script Fading and Fluency Training.** More recent approaches to increasing and maintaining spontaneous communication have taken the form of script fading and fluency training. Script fading includes the presentation of a visual or auditory model of an appropriate verbal interaction. Scripts are systematically faded by slowly removing words from the script to transfer stimulus control to the natural interaction contingencies (Duffy & Healy, 2011).
Krantz and McClannahan (1993) examined the effects of fading a written script on peer interactions in four children with autism. During baseline, the students received written instructions to “Do your art” and “Talk a lot.” The instructions did not increase social interactions. Ten scripted statements and questions were introduced (e.g., “Mike, what do you like to do best?”). The introduction and fading of scripts significantly increased and maintained social interaction.

In a follow-up study, Krantz and McClannahan (1998) examined a script fading procedure to develop reading skills in three children diagnosed with autism. Frequency of scripted interactions, elaborations, and unscripted interactions were assessed using a multiple baseline across participants design. During baseline, the experimenter prompted the child to point to a picture in a picture schedule and complete the task. Prompts were faded from manual guidance to hand over hand, to shadowing, and eventually having the experimenter on the other side of the room. During the teaching phase, textual scripts (e.g., “Look/Watch me”) were paired with 10 of the 16 total activities on the picture schedule. The teacher manually guided the participant to the picture schedule and textual script. If the participant did not read the script, a verbal model of the textual script was provided. The child was then manually guided to all the necessary materials (e.g., hat, or basketball) and prompted to say the script and perform the task (e.g., “Look” and put on the hat). Each script was faded by cutting away portions of the cards, thus removing portions of the stimuli. No participants interacted with a teacher during the baseline condition. Scripts increased spontaneous interaction and were maintained after scripts were faded. Although additional research is needed, script fading has displayed positive effects for teaching children with ASD communication skills.
Similar to script fading, fluency training is a treatment that has recently been utilized to increase spontaneous communication. Fluency is a measure of accuracy and speed, and it has been well established in academia as superior to acquisition, which focuses solely on accuracy (Duffy & Healy, 2011). In the past, fluency training has focused on improved retention, resistance to distraction, emergence of complex untrained behavior, and improvements in academic areas (Duff & Healy, 2011). More recently, fluency training has been applied to improve spontaneous communication skills in children with ASD. For example, Fisher, Howard, Sparkman and Moore (2010) demonstrated the effectiveness of fluency training by increasing sentence complexity and length with four children who had ASD. In this experiment, eight pictures of adults were presented whose behavior could be depicted by a subject, verb, and a direct object. These pictures were separated into four stimulus sets. During probe Phase 1 and 2, two sets of pictures were shown to the participant with an instruction “What do you see?” “Look, what is happening?” The average word utterance prior to training was one to two per photograph. During Training Phase A sentences including a noun and verb were taught. Phase B consisted of noun, verb, and direct objects. Following the intervention, the average word per photograph increased to six, and was maintained for two weeks following training.

**Peer Mediated Interventions.** Finally, peer mediated interventions may be used to improve communication skills in children with ASD. Adult mediated approaches involve teachers, parents, or care providers manipulating environmental contingencies to alter the frequency of certain behaviors. Peer mediated approaches utilize peers to teach appropriate social skills thus eliminating the need to transfer the newly acquired social
skills from adult to peers (DiSalvo & Oswald, 2002). One criticism of researchers who apply adult mediated approaches to increase social skills is that the skills do not easily generalize to peers.

Facilitating integration of children diagnosed with ASD into typically developing classrooms has raised questions as to whether children with ASD can benefit from typically developing peer models (Egel, Richman & Koegel, 1981). Peer modeling literature contains conflicting evidence regarding the effectiveness of peer modeling for teaching children with ASD (Jones & Schwartz, 2004). Charlop and Walsh (1986) assessed the effects of a time delay procedure and peer modeling procedure on increasing spontaneous verbalizations of four boys diagnosed with autism. Two participants were taught to say “I love you” in response to a hug from a familiar adult using a time delay procedure. After the spontaneous verbalization met criteria, these participants were used as peer models for the remaining two participants. During this condition, the participants that had not received training were verbally and physically prompted (if needed) to observe the previously trained participants engage in the desired behavior (e.g., saying “I love you” in response to a hug). After peer modeling, the untrained participant was presented with a hug and given 10 s to vocalize the modeled response. The peer modeling was presented three times to each of the remaining two children with no success. Afterwards, they were presented with the same time delay procedure, and appropriate vocalizations were quickly acquired. The overall results indicated that peer modeling was ineffective in increasing spontaneous verbalizations.

Despite these results, peer modeling has been shown to improve skills such as language, social play, vocational skills, and motor responses. For example, Jones and
Schwartz (2004) sought to extend modeling research by comparing the effectiveness of typically developing peers, siblings, and adult models on acquisition of novel language skills. Three preschool children diagnosed with ASD were participants in this study. This study implemented a parallel treatments design across three stimulus sets. The pre-baseline condition consisted of identifying 27 stimuli for each participant that was not already within his/her repertoire. For each picture, the child could receive one of three prompts. These consisted of actions (e.g., “What is this person doing?”); professions (i.e., “Who is this person?”); or opposites (i.e., “If this is open, then this is__?”). In the modeling phase, the experimenter presented a picture card and a question about the picture to the model. After the model responded correctly to the question, the same directives were then given to the child participant. Feedback (i.e., “that’s right”; “correct”) was delivered contingent upon correct answers, and incorrect answers were placed on extinction. This process was conducted for nine trials with each model. Results indicated that all children responded well to all forms of modeling meeting criterion in 22 of the 24 possible stimulus sets, and these results were maintained across all participants at two weeks follow up. This study demonstrates that not only peer modeling, but adult and sibling modeling may be an effective treatment option to increase communication skills in children diagnosed with ASD.

Many interventions have effectively increased language and communication skills in children with ASD. To ensure these effective research-based interventions are implemented and understood across all professionals working with children with ASD, a universal language describing verbal behavior should be accepted.

Verbal Behavior
Sundberg and Michael (2001) indicated that due to language deficits in children with ASD, language skill programs are major goals of any training program. Despite the success of behavior analytic treatments for children with ASD, most current programs use language that is not consistent with Skinner’s (1957) analysis of verbal behavior (as sighted in Sundberg & Michael, 2001). Although the term verbal behavior has become widely popular within the behavior analytic community, most research prior to the publication of this article did not make use of Skinner’s concepts and terms when teaching language skills (Sundberg & Michael, 2001). In the past 10 years there has been much research on teaching mands, tacts, and intraverbals to children with ASD, although more research is needed.

Verbal behavior is defined as behavior that is reinforced through the mediation of a listener (Skinner, 1957). According to Skinner, verbal behavior is broken down in individual units called *verbal operants*, which are identified by a response of a given form followed by a given consequence. Certain responses are followed by certain consequences (Skinner, 1957). Skinner identified six elementary verbal operants, four of which will be defined and discussed in further detail below.

A *mand* is a verbal operant in which a speaker asks for or demands what he/she wants (e.g., “Milk, please”), and is under the stimulus control of deprivation or aversive stimulation and specific reinforcement the delivery of what the individual wants or termination of a specific activity or demand (Skinner, 1957, pg. 35). The second operant, a *tact*, is described as a response evoked by a particular object, event or property of an object or event. Thus, a speaker names things that he/she has direct contact with (e.g., Saying “Look, a plane” or “Milk”) when it is present and this is under the control of
nonspecific social reinforcement (Sundberg & Michael, 2001). Next, an *echoic* is merely the repetition or mimicking of a speaker’s verbal behavior, which is under the control of nonspecific social reinforcement (Sundberg & Michael, 2001). Finally, an *intraverbal*, is a verbal discriminative stimulus, which evokes a response that shows no point-to-point correspondence with the verbal stimuli, which evoked them and is also maintained by nonspecific social reinforcement (Skinner, 1957, 71). An example of *intraverbal* behavior is conversational speech, where a speaker responds to the verbal behavior of others (Sundberg & Michael, 2001). As described above, children with autism show delays and impairments in reciprocal social interaction skills, communication skills, and may have well developed non-utilized speech. These communication deficits may be due to a lack of an appropriate intraverbal repertoire.

**Establishing Intraverbal Repertoires**

There has already been much research dedicated to increasing intraverbal skills in children with ASD utilizing three prompt types (echoic, textual, and pictorial). Cook (2009) described echoic prompts as verbal directives or sentences that are provided to an individual and function as a verbal model or script. Textual prompts serve the same purpose as echoic prompts, except the model or script is written, not vocalized. Finally, pictorial prompts are visual stimuli (pictures) provided to individuals as a model for the individual to respond. Verbal and echoic prompts can be systematically faded by eliminating portions of the stimuli itself or by the addition of a time delay, thus transferring stimulus control to the natural controlling stimuli. In the case of pictorial prompts, transfer of stimulus control is commonly carried out through time delay procedures (Cook, 2009).
Comparison of Prompt Strategies

Finkel and Williams (2001) conducted the first study to directly compare two prompting strategies (textual and echoic) to establish intraverbal skills in a six-year-old boy diagnosed with autism. Questions likely to be asked by peers (e.g., “What is your mother’s name?”) and needed for safety (e.g., “Where do you live?”) were selected for intraverbal exchanges. The baseline phase consisted of 12 questions randomly assigned to two prompt types. Utilizing a multiple baseline design, data were collected on response type (correct full sentence answers, correct partial answers, and nonsense or no answers). In the textual prompt condition, the experimenter presented a written answer to a participant with verbal instruction to “read this.” In the echoic prompt condition the experimenter verbally presented the answer to a question. Each participant was verbally instructed to repeat the answer prior to each prompt. Both prompt types were systematically faded by removing words from the prompt over successive trials. During the baseline condition, no questions were answered correctly. After implementation of the echoic prompt procedure, the participant showed improvement in correct partial responses that were maintained for two-weeks after training was completed. After implementation of the textual prompt fading procedure, correct full sentence answers and correct partial answers immediately improved and were maintained at high levels. These results indicated textual prompts may be more effective than echoic prompts to teach intraverbal behavior to children with ASD.

This may be due to a few possible reasons. First, it is possible that some children with autism have high visual acuity and deficits in auditory processing (Finkel & Williams, 2011). Second, textual prompts may require less social interactions than
echoic prompts. Given that lack of impairments in social interactions is a defining characteristics of autism, the use of a prompt procedure that requires minimal social interactions may be preferable and more effective for this population. A limitation of this study was that the duration of the presentation of each prompt differed. That is, textual prompts were present until a response was emitted, whereas echoic prompts were presented momentarily. This exposure length may have contributed to the increased effectiveness of the textual prompts.

Cook (2009) took the next step in comparing the efficacy of prompt types and systematically replicated the study by Finkel and Williams (2001). Three preschool-aged children diagnosed with ASD served as participants. Data were collected utilizing a multiple baseline design on three dependent measures: a) trials to criterion during acquisition b) full independent correct answers, and c) partially correct answers. The baseline phase consisted of 12 questions that were probed once vocally and once textually, and all unknown words were taught in a pre-training condition. During the first textual prompt condition the experimenter presented a question vocally (e.g., “What is your dad’s name?”), which was immediately followed by the presentation of the answer (i.e., the experimenter said the name of the participant’s father). The following trials included a 2 s delay between the prompt and the answer. Both prompt conditions were conducted in the same manner with the exception of the prompt type. Both prompt types were systematically faded by removing words from the prompt over successive trials until no prompt was provided. Data indicated that echoic prompts resulted in fewer trials to acquisition than textual prompts for all three participants. These results conflicted directly with Finkel and Williams (2001).
A factor that may account for the increased effectiveness of the echoic prompts when compared to textual prompts for these participants is that it may have been easier for participants to respond to the prompt type when it was presented in the same form as the expected response. It, however, is unclear if exposing participants to each type of prompt type would influence these results. The participants’ reading abilities may have also played a role in acquisition rates of textual prompts, as in the previous study (Finkel & Williams, 2001). Lastly, textual prompts were presented for longer periods of time than echoic prompts. Textual prompts remained present while the participants respond whereas, echoic prompts were temporary and the participants were required to respond in their absence.

Vedora, Meunier and Mackay (2009) utilized an alternating treatments design to systematically compare the effects of various prompt types. This study, like Cook (2009), extended the research conducted by Finkel and Williams (2001) by assessing the effects of textual and echoic prompts on acquisition and generalization of intraverbal behavior for two children with autism. The dependent variable in this study was accurate one word responses to questions (e.g., “What do you do with a fork?”). The baseline phase consisted of the presentation of 20 questions. No prompts or contingent consequences were presented during baseline. Both prompting conditions employed a progressive time delay procedure (Schuster et al., 1988) to transfer stimulus control from a prompt to a naturally occurring stimulus. Both participants reached criterion in fewer trials in the textual prompt condition than the echoic prompt condition. Generalization was conducted using two additional teachers after both participants reached mastery criterion, and both participants responded at 90-100 percent in during these probes.
The increased effect of textual prompts in this study may have been attributed to the participants responding better to visual cues. In addition, the duration of prompt presentation was not equated as was the case in previous research (Cook, 2009; Finkel & Williams, 2001). Limitations of this study include the inability to equate the instructional sets. That is, results of this study may not have been a product of the prompt type, but the difficulty of the questions in each set.

Coon (2010) examined whether reinforcement history associated with prompt types influenced the acquisition rates of intraverbal behavior. This study included four typically developing students. The effectiveness of echoic and picture prompts was assessed to teach intraverbal responses to a new language. This study also assessed whether increased exposure to a prompt type would overcome sensitivities related to another prompt type during intraverbal training. During baseline, three questions were asked three times without prompting or reinforcement (e.g., “What’s Pomme?” [apple]). After baseline, a pre-exposure phase assessed the effectiveness of each prompt type prior by systematic exposure to either prompt type. A progressive time delay procedure was used to transfer stimulus control from the prompt to the natural controlling stimulus (Schuster et al., 1988). The next phase of this experiment was exposure training, which provided increased exposure to a particular prompt type. Four three-question sets were trained to criterion utilizing one prompt type during this condition. Lastly, the post-exposure comparison phase examined whether exposure with a particular prompt type resulted in increased acquisition of intraverbal behavior. Results indicated that three of four participants reached mastery criterion in fewer trials when instruction was delivered with the use of echoic prompts prior to exposure training. That is, participants
demonstrated responding to mastery criterion with the stimulus set associated with exposure training in fewer trials.

These data suggest the rate of acquisition of a specific prompt may be a function of prompt exposure history. The sets of stimuli used during training, however, were not assessed for difficulty. Thus the effectiveness of one procedure could be due in part to question difficulty. Second, there was no control for quality of social praise provided for correct answers. The quality of reinforcement may also have contributed to prompt effectiveness. Finally, the amount of training trial blocks per day was not standardized. Sessions were terminated early due to lack of participant compliance or participants’ request to stop. These inconsistencies may have affected future sessions.

Ingvarsson and Le (2011), like Coon (2010), proposed that previous research findings may not be the best way to select a prompt type. Other important variables such as individual preference for a prompt type and exposure history of a certain prompt type need to be taken into consideration. This study compared the efficacy of textual, echoic, and pictorial prompts during intraverbal training, and evaluated repeated exposure to each prompt type. It was hypothesized that repeated exposure could reduce differences in results across prompt types. Data were collected on correct unprompted and prompted answers to questions from four children with ASD. Fifty-one questions were probed three times each (for each prompt type) over a 3 day period to determine unknown questions. Two 5- question sets were assigned to each prompt type per participant (picture and echoic), though one participant had an additional question set for textual prompts. This study contained two intraverbal training conditions, which consisted of comparing the efficacy of each prompt type on establishing intraverbal behavior utilizing a 5 s constant
prompt delay procedure, and the second included a concurrent chains assessment, which examined preference for prompting tactics, in addition to prompt comparison. Results of the first training phase indicated that all four participants met criterion in fewer trials during the echoic prompt phase, whereas in the second training phase, echoic and picture prompts were equally effective. This data offer support to the notion that not only the prompt type but additionally the prompt history may have an effect on subsequent rates of intraverbal acquisition.

In this study, as with previous studies, the question difficulty was not equated across each prompt set. Therefore, results could have been affected due to question difficult, in place of prompt effectiveness. Second, it was not known if the participants were able to respond to the prompt types, thus previous exposure could have affected responding. Third, it is not known what elements of the question gained stimulus control over responding. For example “What coin is worth 25 cents?” will emit the correct answers, but it is unknown whether the numeric amount of the coin or some other aspect of the question functioned as the discriminative stimulus for the correct answer “quarter”. Future research should target questions that have only slight differences (e.g., using different coin values) so that only the desired element is the discriminative stimulus for responding.

Ingvarsson and Hollobaugh (2011) was only the second study to compare the efficacy of picture prompts to another prompt type with children diagnosed with ASD. This study compared two prompt types (pictorial and echoic) using an alternating treatment design to establish intraverbal behavior in three boys with autism. Five questions were assigned to each prompt condition, and correct prompted and unprompted
one-word answers were recorded as the dependent variable. In the baseline condition, each session consisted of the experimenter asking each question set, delivering praise for correct answers, and ignoring incorrect answers. During the prompt comparison phase, the experimenters utilized a consistent 5 s prompt delay procedure with the exception of the first three trials, which was a 0 s delay. Descriptive praise was delivered for correct answers to questions and prompts were initiated after a 5 s delay for incorrect or no response. Only one correct answer was recorded during baseline and one during generalization probes. Following training, acquisition and generalization were evident in both prompt conditions across all participants, but were achieved quicker under the picture prompt condition. Prompt history was not known for participants in this study and thus could have contributed to responding. Future research should evaluate the individual’s prompt history. It may also be helpful to eliminate the word “say” from the vocal condition or put “say” in both conditions to equate the prompt conditions.

In summary, only six studies to date have compared the efficacy of prompt types when establishing intraverbal behavior. Previous research comparing prompting methods to transfer stimulus control for intraverbal exchanges has focused solely on the respondent. That is, of the six previous research studies comparing prompting methods, none focused on the initiator of intraverbal behavior.

**Manding for Information**

There are different types of Skinner’s verbal operant the *mand* which are controlled by motivation variables such as deprivation and aversive stimuli resulting in gaining access to tangible items, information about the environment, or removal of aversive stimuli (Shafer, 1994; Sundberg & Michael, 2001). Mands for information are
said to be reinforced by information provided about the environment, which is delivered to the listener (Sundberg & Michael, 2001). To date, research on teaching mands for information has focused on participants asking how to come into contact with desired tangible reinforcers by providing instructions directing them to the items (Lechago, Carr, Grow, Love & Almason, 2010; Shillingsburg & Valentino, 2011; Sundberg, Loeb, Hale & Eigenheer, 2002; Williams, Perez-Gonzalez, & Vogt, 2003). Some research has focused on one mand leading to direct tangible consequences (e.g., “Can I have milk”) (Shillingsburg & Valentino, 2011) whereas others focused on response chains (multiple mands) that inevitably resulted in the acquisition of the desired tangible stimuli (Lechago et al., 2010; Williams et al., 2003).

For example, Lechago and colleagues (2010) utilized a behavior chain to obtain desired items such as the making and consumption of strawberry milk (e.g., “Where is the spoon?” “One of your teachers has it.” “Who has the spoon?”). Williams and colleagues (2003) examined behavior chains, which required the participant to emit three questions (“What’s that?” “Can I see it?” and “Can I have it?”) before access to the terminal reinforcer (a tangible item in this study) was delivered. Sundberg and colleagues (2002) taught children to mand for items with “where” and “who” questions. For example, a child was given access to a highly preferred item in a container, and was then presented with an empty container. Once the child gave the mand “Where is the (item)?”, it was delivered. The “who” condition began the same as the “where” condition, but the experimenter said “I gave it to a teacher.” The student then had to mand “Who has it?” The teacher would then deliver the reinforcer. Finally, Shillingsburg and Valentino (2011) extended research on teaching mands for information that included “how” as a
question. That is, by asking a question that started with the word “how,” participants could gain access to instructions related to a desired item or ongoing activity. For example, when a child watched TV (a preferred activity) with the volume off, he/she stated he could not hear the television show. The experimenter instructed the child to un-mute the TV. If the child did not know how to do so, the correct mand would be to ask “How?” or “How do I un-mute?” These questions resulted in obtaining information to directly contact or utilize the desired objects.

In summary, all the prior research on teaching mands for information has been focused on the presentation or manipulation of tangible items as the terminal reinforcer. No research to date has been conducted on teaching mands for information maintained by access to social reinforcement (i.e., engaging in a conversation with another individual). Manding for information is important for the development of intraverbal behavior because the listener provides information, which allows the speaker to precisely react to their environment and acquire new verbal behavior (Sundberg & Michael, 2001).

Therefore, the purpose of the present study was to extend previous research in both the areas of prompt comparison for establishing intraverbals and mands for information. First, this study examined the efficacy of textual and echoic prompting to increase mands for information within a conversational frame. This aim expands upon previous prompt comparison research by evaluating the efficacy of prompt types on initiations, in the form of manding for information, in place of responses during intraverbal exchanges. The second aim of this study focused on extending previous research on mands for information by utilizing social reinforcement in place of tangible reinforcement to increase mands for information. Manding for information that is
maintained by social reinforcement (i.e., another person answering a question posed by
the speaker) may help children with autism excel in their social skills by maintaining or
learning to initiate appropriate interactions with peers and thereby avoiding social
criticism or isolation.
Method

Participants, Setting & Materials

Three students with a diagnosis of ASD were recruited to participate in this study. The students’ ages ranged between 8-15 years. All participants were enrolled in a therapeutic center for children with autism in Northeast Ohio (referred to as the “Center” from this point forward). All participants had extensive tacting and manding repertoire that consisted of at least 100 items and answered basic questions related to personal information (e.g., “What is your name?” “How old are you?”). In addition, each participant had an established intraverbal repertoire, which included fluency in answering what, who, where questions but experienced deficits in spontaneous question asking. For example, each participant answered questions (e.g., “What games do you like?”) but did not ask a similar or identical question to another individual spontaneously. Each participant also had a basic reading repertoire of five to eight word sentences. Participant characteristics were assessed by the Verbal Behavior Milestones Assessment and Placement Protocol (VB-MAPP; Sundberg, 2008) and other informal pre-training assessments that included the experimenter asking basic questions (i.e., “What’s your name?” “What’s your favorite color?”), and presenting each participant with five short sentences to read prior to beginning the study (e.g., “What is you favorite color?”).

Steve was a 12-year-old male with a diagnosis of ASD who had attended the Center for four years at the start of the study. He was not receiving any prescribed medication during the study. Steve did not have difficulty describing future events, but did have difficulty describing events that had happened in the past. Steve could also answer multiple WH- (i.e., what, who, where) and HOW questions as indicated on the
VB-MAPP. A goal on Steve’s Individualized Education Plan (IEP during the academic year was to initiate appropriate questions during a conversation.

Wayne was a 15-year-old male with a diagnosed of autism and obsessive compulsive disorder that had attended the Center for seven years. He was not on any prescribed medications at the time of the study. Wayne could answer multiple WH-questions, suggest possible solutions to problems, and take turns adding details to stories with the experimenter, as indicated on the VB-MAPP. He displayed trouble engaging in conversations with at least three intraverbal exchanges as well as answering, “I don’t know” to unknown questions. An IEP goal for Wayne during the academic year was to initiate appropriate questions during a conversation.

Ivan was an 8-year-old with a diagnosis of ASD and Attention Deficit Hyperactivity Disorder (ADHD) that had been enrolled at the Center for one year. He was prescribed Focalen™ once daily as an extended release capsule at the start of the study, but stopped taking this medication after the first three baselines sessions were completed. Ivan did not take any medication during the remainder of this study. Ivan answered multiple WH- questions, give multiple pieces of personal information, and describe past events, as indicated on the VB-MAPP. Results of this assessment also indicated he struggled with taking turns, adding details to a story, saying three different things about a single item, and summarizing stories. An IEP goal for Ivan during the academic year was to utilize appropriate social skills in conversation.

All baseline, training, and follow up sessions were conducted in a quiet area of the building, in a classroom adjacent to the students’ regular classroom and lasted approximately 5 min. At least one session, which included both prompt types, was
conducted per day for each participant. The rooms where sessions were conducted were separated from the main classroom by a door, and were typically utilized for lunch, small group instruction, and one-on-one instruction. Each room was approximately 10 by 18 ft and contained various school supplies unrelated to this study. Room one contained a 6 by 4 ft table, eight chairs, 2 by 3 and 3 by 5 ft end tables holding microwaves and lunch supplies, a dry erase board, and high shelves containing lunch and classroom supplies. Room two contained two tables (3 by 5 ft, and 4 by 6 ft), both pushed up against the wall of the room, or placed in the center of the room); shelves containing books and learning materials, and a dry erase board. Generalization sessions were conducted in the same quiet area as the baseline and training.

Materials included standard laminated 3”x 5” index cards in which textual prompts were written for each stimulus set, (font Times New Roman 36), pencil for recording data, data sheets (see Appendix D), and treatment integrity data sheets created for the purpose of this study (see Appendix E).

**Dependent Variable & Operational Definition**

Three dependent variables were targeted: (a) Correct *mand* for information, (b) Incorrect *mand* for information, and (c) No *mand* for information. A correct *mand* for information was defined as: complete, multiple word, grammatically correct, and accurate questions (e.g., “What’s your favorite food?”). An incorrect *mand* was defined as: incomplete question, repetition of a previously answered question, (within the same trial) or nonsensical response (e.g., echolalia, unrelated or bizarre speech). No mand for information was defined as: no emitted verbalization within the allotted time delay (0-8 sec).
Experimental Design and Interobserver Agreement

An adapted alternating treatments design (Holcombe, Wolery & Gast, 1994) was implemented to compare the efficacy of echoic and textual prompts on the acquisition and generalization of mands for information. This design differs from an alternating treatments design in one way. Each intervention was applied to two separate, functionally independent, and equally difficult behaviors (Holcombe et al., 1994). Thus, this design permits evaluation of prompt types within and across participants. Baseline was implemented simultaneously across all participants, followed by training using each prompt type for a specific stimulus set (i.e., set of questions). Stimulus sets were randomly assigned to a prompt type, and these were counterbalanced across participants. For example, the game stimulus set was assigned to textual prompt procedure and the food stimulus set was assigned to echoic prompt procedure for Steve and Ivan, then Wayne received the opposite training in which the echoic prompt procedure was assigned to the game stimulus set, and the textual prompt procedure was assigned to the food stimulus set. This helped control for the possibility that question difficulty may have an impact on the results of the study. By counterbalancing the stimulus sets, there is a stronger possibility that results were attributed to the effects of the prompt type, and not question difficulty. Stimulus sets presentation per participant was counterbalanced daily as to not have one stimulus set consistently beginning or ending each session. In addition, prompted questions within each stimulus set were randomized in attempt to produce novel conversation and eliminate memorization of a static conversational script.

Interobserver agreement (IOA) was collected during 43% of all sessions across participants. Specifically, IOA was collected during 32% of Steve’s total sessions, 60%
of Wayne’s totals sessions, and 42% of Ivan’s total sessions. The data sheets used to collect IOA were the same as that used by the primary observer, and this data was collected in vivo by an independent trained observer. Secondary observers were trained via verbal instruction on all procedures, recording methods, target behaviors and operational definitions used during data collection prior to the start of the study. Operational definitions were included on the data sheets and pilot data was collected with the secondary observer until 80% agreement was attained with the primary observer (the experimenter). Interobserver agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. Agreement was defined as both the primary data collector and the secondary observer recording the same response form (e.g., correct, incorrect or no mand for information). If any part of the recording is not the same across observers, a disagreement was scored. Mean IOA for all sessions across all participants scored 97% (range, 96.2 - 97.8%; see Tables 1-3 for individual results).

Procedural integrity (PI) was also recorded during 36.6% of sessions across participants (range, 22-43%). A second trained observer collected data on PI via in vivo observation. A checklist of required responses by the experimenter was used to ensure the same steps were followed throughout all baseline, training, generalization, and follow-up sessions (see Appendix E). Procedural integrity was calculated by summing the number of correctly implemented responses by the total number of possible responses and multiplying that number by 100. If a step in the checklist could not be scored as correct or incorrect due to an incomplete session, or steps not utilized in a given phase, then that step was indicated as “N/A” and not utilized in PI calculation. Procedural integrity was
scored at 100% throughout the study across all participants (see Tables 1-3 for individual results).

Procedure

Pre-Training. Questions related to all three conversational topic categories (see Appendix A) were probed to determine if appropriate accurate responses were within each participant’s repertoire prior to beginning the study (e.g., “What is your favorite game?” “My favorite game is SORRY.”). When an accurate response was not emitted by the participant (e.g., “What is your favorite game?” or “I like pizza.”) or no response occurred, a new question was substituted until a question with a response emerged.

Prompt Exposure. Following the pre-training procedure, 10 questions (five prompted using an echoic prompt, and five prompted with a textual prompt) were presented and taught to a mastery criterion (80% correct independent responses across two trials). This ensured all participants had similar histories of reinforcement with each prompt type prior to the start of the study, and controlled for the possibility that a history of reinforcement with any one specific prompting procedure would impact correct or incorrect responding during the study. Questions included in the pre-training procedure were not related to the content of the study. Questions selected for this section were based on general educational questions (e.g., “What is the state bird of Ohio?” or “What is the capital of Ohio?”).

Baseline. Following the prompt exposure condition, baseline sessions commenced. During baseline, the experimenter sat at a table across from the participant and presented the instruction: “I am going to ask you some questions about (topic) and I want you to answer and then ask me four questions about (topic) today.” The
experimenter then asked the participant one of five pre-selected questions based on three topics of conversation (e.g., games, food, and school). All answers to the pre-selected questions were within the participants’ repertoire, as determined by the pre-training phase. Following an answer by the participant, the experimenter presented additional small talk (e.g., elaborations, statements, or acknowledgment) to simulate, as close as possible, natural conversation. A 5 s delay was provided following the small talk in which the participant had the opportunity to present a question to the experimenter in order to continue the conversation. When the participant did not respond, or responded incorrectly after 5 s, the trial was terminated, no mand or incorrect mand was recorded, and a new question was presented on the same topic. When a correct mand was emitted, the experimenter scored a correct mand, answered the question, and began a new trial. Questions unrelated to the topic of conversation were not answered. A direction of “We are talking about (topic) right now” was provided and the trial was terminated. This procedure continued until four questions in the stimulus set had been presented to the participant. A flow chart of the sequence of presentation is presented in Appendix B. During baseline, the experimenter delivered verbal praise (e.g., “You’re doing a great job staying focused.”) following the presentation of every two questions. Praise was delivered contingent on keeping on task, sitting at the table, and making eye contact. This phase consisted of at least three sessions, or until stability in responding is demonstrated upon visual inspection of the data.

**Training.** Following baseline, training was initiated with each participant. During training, each participant received the direction, “I am going to ask you some questions about (topic) and I want you to answer and then ask me four questions about (topic)
The participants were prompted to emit questions in a conversational frame using one of two prompt types (echoic and textual). During each session, the experimenter answered questions and provided small talk related to the same general topics as in baseline (e.g., games, food, and school). Each stimulus set contained at least four questions relating to one topic (See Appendix A for complete list of each stimulus set). All questions contained approximately the same number of words (five to eight), and each session consisted of one presentation of four questions in each stimulus set during a conversation.

**Echoic Prompts.** For each participant, one stimulus set was taught using echoic prompts. Echoic prompts were always presented vocally with the instruction to “Say, ___” prior to the prompt being delivered. Identical to baseline sessions, training sessions included small talk by the experimenter to simulate natural conversation. Each trial began with the instruction, “I am going to ask you some questions about (topic) and I want you to answer and then ask me four questions about (topic) today.” The experimenter began each conversation in the same manner as the baseline phase. The experimenter presented a question to the participant, the participant answered the question, and then small talk was presented by the experimenter. A delay (ranging from 0-8 seconds) was implemented during this phase to provide the participant with an opportunity to ask the experimenter a question on a topic (see Appendix C for flow chart of the sequence of prompt presentation).

Prompts were presented using a progressive time delay procedure to transfer stimulus control from the prompt to naturally occurring stimuli (Touchette, 1971; Vedora et al., 2009). Initially, prompts were provided immediately following presentation of
experimenter small talk to the participant or experimenter answer to a question (i.e., 0 s delay). The delay between small talk and the opportunity to respond was systematically increased in order to allow the participant the opportunity to respond independently. Thus, the initial trial in each treatment phases consisted of a 0 s prompt delay that was immediately increased in the second trail to a delay of 2 s. Beginning with the 2 s delay, after every four trials with both prompt types, the time delay was systematically increased by 2 s. (e.g., 2-4, 4-6, 6-8 s)

After a correct mand was emitted by the participant, social praise was delivered (e.g., “Great question asking!”), the experimenter provided an answer to the question and continued with small talk before the next trial began. If a correct mand was not emitted within 5 s of the presentation of the prompt, then the prompt was represented in the same fashion until a correct mand occurred. This procedure was implemented in an attempt to equate the length of prompt presentation. For example, textual prompts were initially presented for five seconds. If no response occurred during the 5 s time frame, the prompt was removed and re-presented in the same fashion. Echoic prompts were re-presented every 5 s following no response from the participant. These procedures were continued until a correct mand was emitted. A stimulus set was considered mastered when the participant displayed four correct independent mands for information across two consecutive sessions.

**Textual Prompts.** Textual prompts were delivered in the same way as the echoic with the exception of the prompt being presented in written form. A verbal instruction to “Say _____” was presented before a textual prompt was delivered in attempt to equate the prompting conditions. This prompt type was also faded using a prompt delay
procedure as described above. Textual prompts were presented on a standard 3”x 5” index cards on which textual prompts were written for each stimulus set, (font Times New Roman 36). Textual prompts were presented at eye level approximately an arm’s length away from the participant. Incorrect responses resulted in re-presentation of the instruction “Say” and a gestural point to the textual prompt. This process was repeated, when needed, until the participant responded by asking the experimenter the question presented on the card. A stimulus set was considered mastered when the participant displayed four correct independent mands for information across two consecutive sessions.

**Generalization.** A generalization probe was conducted after the participant demonstrated the pre-determined mastery criterion for both training conditions. The generalization phase consisted of the presentation of a social skills lesson in which each of the previously trained stimulus sets was utilized as conversational topics with a peer from the participant’s classroom that was not included in the study. Each participant was instructed to converse with a peer in his or her classroom about a topic (food or games) with the direction “We are going to have a conversation lesson today. I want each of you to ask the other four questions about (topic) in the next five minutes”. During the session the experimenter mediated the conversation, if necessary, with a verbal prompt (“Ask a question”) to the untrained peer if no verbalization from either student occurred following 8 s. If, again, either student did not deliver a mand following 8 s, a textual prompt was presented to the peer. The generalization probe took place in the students’ classrooms at a table designed for group lessons or lunch. Each participant received one probe trial following training, which lasted approximately 5 min. The experimenter recorded the
number of correct mands for information in relation to the topic of discussion (games or food) emitted by each participant. No prompts or reinforcement were delivered during this phase. Correct and incorrect mands for information were recorded as in previous phases.

Spontaneous manding for information was also assessed for generalization across a novel conversational topic. Four questions relating to a new untrained topic (i.e. school) were presented once in the same manner as the baseline condition. This probe took approximately 5 min. and was conducted in a quiet area of the building, in a classroom adjacent to the students’ regular classroom at the Center. No prompts or reinforcement were delivered during this phase. Correct and incorrect mands for information were recorded as in previous phases.

**Maintenance.** Maintenance probes were conducted at one, two, and three weeks following generalization probes. Maintenance probes were conducted in the same manner described during baseline for each stimulus set trained.
Results

Results for correct independent mands (CIM) are presented for all participants in Figure 1. During baseline, all participants displayed low variable manding. No participant exceeded two CIM during any baseline session. In the prompt delay training phase, acquisition was evident for two of the three participants in both prompt conditions. The third participant required an additional training phase consisting of prompt fading to reach mastery criterion for both prompt types. Overall, the echoic prompt stimulus sets requires less training sessions to reach the pre-determined mastery criterion for two of the three participants and results from generalization and follow-up probes varied across participants.

Results for the total trials to criterion are displayed in Figure 2. The textual prompt stimulus sets required more training sessions to reach mastery criterion for two of three participants than the echoic prompt. Figure 2 demonstrates the number of sessions needed for each participant to meet mastery criterion with each stimulus set, as well as the sum of all sessions needed to reach mastery criterion for each prompt type.

Figure 3 shows the number of trials needed for each participant to meet mastery criterion with each stimulus set topic (food/games), as well as the sum of all trials needed to reach mastery criterion for each stimulus set topic. Two of three participants met mastery criterion with fewer trials in the food stimulus set topic than the games topic.

Figure 4 displays the number of CIM emitted by each participant, as well as the sum of all CIM up the point of meeting the one prompt type meeting mastery criterion. The amount of mands emitted by all participants was variable. Results indicate a greater number of mands emitted by one participant in the echoic stimulus set, a greater number
of mands emitted by one participant in the textual stimulus set, and one participant with an equal amount of mands emitted in each stimulus set. Overall two additional mands were emitted in the echoic stimulus set resulting in 55 total emitted mands. Specific results for each participant are outlined below.

Steve. During baseline, Steve emitted one CIM in the echoic prompt stimulus set and zero CIM in the textual stimulus set across all sessions. During the prompt delay training phase, he did not emit any CIM until the prompt delay reached four-seconds. CIM increased from zero to three during both prompt conditions once the prompt delay reached six seconds. However, it was not until the eight second delay that Steve initially reached and met mastery criterion levels (4/4 CIM across two trials). Steve required five fewer sessions to meet the pre-determined mastery criterion for the echoic stimulus than the textual stimulus set. That is, the stimulus set taught using echoic prompts required 15 trials to reach criterion while the stimulus set taught using textual prompts required 20 trials (see Figure 2).

As demonstrated in Figure 1, Steve’s first generalization probe resulted in 2/4 CIM while the second resulted in 0/0 and 0/0 CIM for both prompt types. At one-week follow-up, Steve emitted 2/4 and 4/4 correct mands for the textual and echoic prompt stimulus sets, respectively. In an attempt to increase the number of correct mands, booster training was conducted, which consisted of presenting the training conditions in the same manner described for the initial training phase. All booster sessions resulted in 4/4 CIM. Following the booster training, generalization probes were conducted once more and Steve responded with 0/0 and 2/4 CIM in the echoic and textual stimulus sets, respectively.
**Wayne.** During baseline, Wayne emitted two CIM in the echoic stimulus set and three CIM in the textual stimulus set across five sessions. Wayne reached mastery criterion levels in both prompt types during the two-second delay. It was not until the four-second delay that the textual stimulus set met mastery criterion and the echoic stimulus set met mastery criterion in the six-second delay. Wayne met criterion for the textual stimulus set two sessions before the stimulus set taught with echoic prompts (see Figure 1). As seen in Figure 1, Wayne’s first generalization probe yielded 3/4 CIM. The second generalization and two and three week follow-up probes all resulted in 4/4 CIM for both the textual and echoic stimulus sets.

**Ivan.** During baseline, Ivan emitted three CIM in the echoic stimulus set and two in the textual stimulus set across six sessions. During training, Ivan reached 3/4 CIM in both the echoic and textual stimulus sets, but he did not reach mastery criterion levels after eight sessions at the maximum (eight-second) prompt delay. Ivan was exposed to a total of 20 training sessions with a prompt delay before the prompt fading phase was introduced. An additional six training sessions were required before Ivan met mastery criterion in the stimulus set taught using echoic prompts and 10 additional training sessions for the stimulus taught using echoic prompts (See Figure 2). Figure 1 shows the total trials to criterion for both the prompt fading and prompt delay training phases.

As seen in Figure 1, Ivan’s first generalization probe resulted in 4/4 CIM. The second generalization probe yielded 2/4 CIM in the echoic stimulus set and 3/4 in the textual stimulus set. At one week follow up, Ivan emitted 1/4 CIM in the echoic stimulus set and 0/4 CIM in the textual stimulus set. At two-week follow up, Ivan emitted 2/4 CIM in the echoic stimulus set and 0/4 CIM in the textual stimulus set. At three weeks follow-
up, 0/4 CIM were emitted in the echoic stimulus set and 2/4 CIM were emitted in the textual stimulus set.
Discussion

The present study extends findings in both the area of prompt comparison and manding for information. An extension of prompt comparison research was achieved by focusing on the initiator of mands, not the responders (Cook, 2009; Coon 2010; Finkel & Williams, 2001; Ingvarsson & Le, 2011; Vedora et al., 2009). This study also utilized only social reinforcement whereas previous research in this area has focused on tangible reinforcement (Lechago et al., 2010; Sundberg et al., 2002; Shillingsburg & Valentino, 2011; Williams et al., 2003).

The results demonstrate that two of three participants required less training sessions to meet the pre-determined mastery criterion when echoic prompts were implemented than when textual prompts were used. This provides additional support for the efficacy of echoic prompts when teaching intraverbal behavior (Cook, 2009; Ingvarsson & Le, 2011). These results are in contrast to findings of two previous studies that also compared textual and echoic prompts to teach intraverbal behavior (Finkel & Williams, 2001; Vedora et al., 2009). Therefore, additional research may be needed to determine which prompt type is more efficient.

It may be the case that one specific prompt type is more effective and efficient for certain individuals. If this is the case, it would be helpful to develop an assessment to determine which type of prompt will be best suited to teach intraverbal responses to individuals with autism before any training begins. Indirect assessment such as interviews can be conducted with teachers and parents to determine what prompt types are most commonly used and the effects they have had in the past. It may also be possible to determine prompt efficacy via a brief comparison of prompt types, similar to that of the
prompt exposure phase in the current study. In future studies the prompt exposure phase should be assessed for efficacy as well as mastery, and thus can be directly compared with the result of a direct or systematic replication of the current study. Positive correlations may be attributed to the results of the brief prompt exposure phase and that of the experimental results. If such a correlation exists, this procedure may provide a useful and brief descriptive assessment to determine which prompt type teacher, professionals, and researchers should utilize for maximum efficiency when teaching intraverbal skill to children diagnosed with autism.

Some studies have addressed the possibility that the efficacy of a prompt type may be attributed in part to the exposure participants have to any specific prompt type rather than the prompt type being superior itself (Coon, 2010; Ingvarsson & Le, 2011). Coon demonstrated that when a participant had prior exposure to a certain prompt type, that prompt type required fewer trials to reach mastery criterion. The present study attempted to address this limitation by presenting each prompt type to all participants prior to the start of the study until a pre-determined mastery criterion was attained with stimulus sets that were not included in training.

Although results of the present study indicate the echoic prompts may have been more efficient at producing correct independent mands, the difference may not be considered socially significant (i.e., Steve required 20 and 15 trials to criterion in the textual and echoic prompt stimulus sets. Wayne required 8 and 10 trials to criterion in the textual and echoic stimulus sets. Ivan required 31 and 27 trials to criterion in the textual and echoic stimulus sets). These results may be attributed in part to the prompt exposure phase conducted prior to baseline. Even with the closeness in data from both prompt
types there are a few reasons why the echoic prompts may have been more effective than textual prompts. First, as discussed by Cook (2009), it is possible that the participants mands for information more closely resemble that of the echoic prompt and thus transfer stimulus control more efficiently than textual prompts. Also stated by Cook (2009), this may be controlled for by having participants’ respond in the same format as the prompt (i.e., writing a response to a textual prompt). It should also be noted that even though each participant received an equal amount of exposure to each prompt type prior to beginning the study the distribution of prompt types by teacher, parents, and peers may not have been equally distributed. This inequality may have created a stronger reinforcement history for the echoic prompt type.

In addition, it should be noted that even though the textual prompt type required 59 trials to reach mastery criterion across all participants, which is seven more than the echoic prompt type, four of those trials were conducted after a time when one participant had the opportunity to reach mastery criterion in the textual prompt stimulus set but fell ill. Steve became physically ill during session 20 resulting in 0/0 CIM. The subsequent four sessions resulted in 4/4, 3/4, 4/4, and 4/4 CIM. If Steve had not gotten ill during that session, he may have met the mastery criterion in four fewer trials for the textual prompt stimulus set.

Finally, when data was collected from the beginning of training to the trial where the first stimulus set met mastery criterion to ensure equal opportunity to emit CIM in both stimulus sets, participants emitted only two more correct mands in the echoic sets than the textual stimulus sets (see Figure 4). This illustrates that the frequency of CIM
were near identical in both prompt types regardless of what prompt type met mastery criterion first.

Limitations and Future Research

Results of the study should be interpreted with some caution given the following limitations. First, Steve began the zero-second prompt delay with one CIM in each stimulus set. Initially the directions required each participant to begin each stimulus set training session with a question. The directions themselves may have functioned as a prompt to produce a CIM. For this reason the directions were changed immediately to what is indicated in Appendix B. In addition, Steve’s two and three-week follow up sessions were not conducted due to participant absence. The second generalization probe was conducted 36 days after the one-week follow up due to his absences and the school’s winter break. This time between the end of training and the first generalization probe may have contributed to the low number of CIM scored during the generalization probes.

Second, Ivan required an additional prompt fading phase that was not necessary for the other participants in the study. His data indicate three CIM were emitted during the four and six-second prompt delay. However, in the prompt delay training phase, his responses did not again reach three CIM again until session 18 indicating the participant may have become prompt dependent. This may have also played a role during the follow-up probes when no prompts or reinforcement were provided. Future research should utilize a prompt fading procedure in place of a prompt delay procedure to transfer stimulus control from the prompt to natural contingencies in an attempt to reduce prompt dependency.
Third, PI was not recorded for Steve during the baseline phase for either stimulus set. In the training phase, only 7% of sessions in the echoic stimulus set recorded PI measures. The textual stimulus set resulted in a higher percentage of session that the echoic but still fell short with only 15% of sessions having PI measures. In addition, IOA was not recorded for either stimulus set during baseline phase for Steve. The training phase resulted in 27 and 30% of sessions having an IOA measure for the echoic and textual stimulus sets, respectively. Even though Steve had deficiencies in the amount of IOA and PI measures taken during baseline and training, PI was 100% throughout the study and IOA was consistently high (See Table 1-3).

Fourth, the delay during the baseline phase was set at 5 s before the opportunity to respond was terminated and a new trial began. It should be noted that only one stimulus set met the pre-determined mastery criterion prior to the 6 s prompt delay. Thus, most CIM were emitted only after at least 5 s had passed. Therefore, increasing the allotted time to produce a CIM in the baseline phase over 6 s may result in more accurate baseline responding. Future studies should equate the time allowed during baseline and the final training prompt delay to participants to emit a CIM. For example, a systematic replication of this study would allow 8 s to emit a CIM in baseline as that was the maximum prompt delay allowed in the training phase.

Fifth, future studies should address the possibility of manding for information when an establishing operation (EO) and abolishing operation (AO) are present. Shafer (1994) defines an EO as, “an environmental event, operation, or stimulus condition that affects an organism by momentarily altering (a) the reinforcer effectiveness of other events and (b) the frequency of occurrences of that part of the organism’s repertoire
relevant to those events as consequences.” Williams, Donley and Keller (2000) conducted an experiment to teach mands for information maintained by tangible reinforcement. The experimenter presented a box to the participant, which contained a toy and a statement about the object inside (e.g., “I like this one”). The box and statement functioned as an EO for the questions “What’s that?” After that mand reached mastery criterion it no longer produced the reinforcer and functioned as an AO. Thus, the responses to the first mand without gaining access to the tangible item served as an EO for the next mand “Can I see it?” which granted access to the reinforcer.

Sundberg and colleagues (2002) contrived an EO for the location of missing items. The EO in this study was an empty container in which a desired item has previously been found. The participant was then taught to mand for the missing item. Other studies have utilized similar contrived EOs to teach manding for information. Future studies can expand on these studies by utilizing social reinforcement in place of tangible reinforcement. Each trial would include the answer to the question that was previously presented. For example, in the present study, there were instances when a participant repeated the same information presented by the experimenter, even when an answer had already been provided (e.g., “Wayne, what is your favorite food?” “I like pizza. What is your favorite food?”). If this echoic mand occurred, the experimenter stated that the question had been answered and prompted another question (e.g., “Wayne, I already answered that question. Try this one. Say….”). Instead, the experimenter could first state: “My favorite food is pizza. What is your favorite food?” The presentation of the answer to the question by the experimenter will serve as an AO for the participant to echo the questions back to the experimenter.
Sixth, it may have proved beneficial to conduct a formal assessment to determine if manding for information maintained by tangible reinforcement was already within the participants’ repertoires. Without a repertoire including manding for tangible reinforcement, manding for social reinforcement may not be possible and thus may require prerequisite training. It may also be wise for future studies to conduct a preference assessment to determine what topics of conversation are of interest to each individual student. The opportunity to obtain novel information regarding a topic of interest may function as an EO for manding for information. More importantly, the assessment of preference for social reinforcement may be the biggest available EO in research conducted on teaching mands for information maintained by social reinforcement. Social reinforcement should also be assessed across multiple individuals to determine preference for a particular individual’s social reinforcement prior to beginning future research.

Seventh, only three students participated in the current study in a very narrow age range (8-15 years). Directly and systematically replicate are needed to verify the findings of the current study and extend results to additional participants of a variety of age ranges.

Finally, future studies should increase the number of stimulus set questions or include additional stimulus sets during training. Additional opportunities to emit CIM may help promote generalization. Even though this study incorporated small talk and randomized prompt order to control for the possibility that participants were memorizing a script, including additional questions or stimulus sets may provide participants with additional opportunities to mand for information. Additional exposure to manding for
novel information may build that participant’s history for manding for information and thus may help generalization to novel topics and avoid scripted conversation even further. The utilization of multiple experimenters during the training phase may also improve generalization to peers.

In conclusion, this was the first study to assess the efficacy of textual and echoic prompting to increasing manding for information maintained by social reinforcement in a conversational frame. Even though promising results were illustrated in this study, deficits in verbal behavior and spontaneous communication demand additional research. Improved communication in children diagnosed with ASD can lead to a variety of desired skills including, but not limited to, increased safety skills and developed relationships, as well as reduced isolation, increased independence and environmental control.
References


Coon, J. T. (2010). The role of increased exposure to transfer of stimulus control procedures on the acquisition of intraverbal behavior. Unpublished master’s thesis for master’s degree, California State University, Sacramento, CA.


APPENDIX A

List of Stimulus Set Questions

**Stimulus Set 1: Food**

1. What are your favorite foods?
2. What did you eat for breakfast?
3. What restaurants do you like to eat at?
4. What do you like to cook?
5. What are you having for lunch/dinner today?

**Stimulus Set 2: Games**

1. What is your favorite board game/video game?
2. Who do you play games with?
3. Where do you play games?
4. What sports do you play?
5. What is your favorite team?

**Stimulus Set 3: School**

1. What school do you go to?
2. What is your teacher’s name?
3. What is your favorite subject?
4. What do you want to be when you grow up?
5. What do you like about school?
APPENDIX B  
Example Conversations during Baseline

Conversation starter/directions
Experimenter: “I am going to ask you some questions, and I want you to ask me four questions about (TOPIC) today.”

No Response Trial 1
Experimenter: “What is your favorite game to play?” (QUESTION)
Participant: “My favorite game is Super Mario.” (ANSWER)
Experimenter: “Cool, I play Mario”. (SMALL TALK)
TIME DELAY (up to 5-seconds)

Incorrect Mand Trial 1
Experimenter: “What is your favorite game to play?”
Participant: “My favorite game is Super Mario.”
Experimenter: “Cool, I play Mario”.
TIME DELAY (up to 5-seconds)
Participant: “Do you like horses?”
Experimenter: “We are talking about (topic) right now.” End trial

Correct Mand Trial 1
Experimenter: “What is your favorite game?” (QUESTION)
Participant: “My favorite game is Super Mario” (ANSWER)
Experimenter: “Cool, I play Mario.” (SMALL TALK)
TIME DELAY (5-seconds)
Participant: “Do you play baseball?”
Experimenter: “I play baseball sometimes.”
Experimenter; “I prefer basketball.” (SMALL TALK)

No Response Trial 2
Experimenter: “Who do you play Mario with?” (QUESTION)
Participant: “I play Mario with my bother.” (ANSWER)
Experimenter: “That must be fun.” (SMALL TALK)
TIME DELAY (up to 5-seconds)

Incorrect Mand Trial 2
Experimenter: “Who do you play Mario with?”
Participant: “I play Mario with my brother.”
Experimenter: “That must be fun”. 
TIME DELAY (up to 5-seconds)
Participant: “Do you like horses?”
Experimenter: “We are talking about (topic) right now.” End trial
Correct Mand Trial 2
Experimenter: “Who do you play Mario with?” (QUESTION)
Participant: “I play Mario with my brother.” (ANSWER)
Experimenter: “That must be fun.” (SMALL TALK)
TIME DELAY (5-seconds)
Participant: “Do you play baseball?”
Experimenter: “I play baseball sometimes.”
Experimenter: “I prefer basketball.” (SMALL TALK)

No Response Trial 3
Experimenter: “What sports have you played?” (QUESTION)
Participant: “I play football and baseball.” (ANSWER)
Experimenter: “Hey, me too!” (SMALL TALK)
TIME DELAY (up to 5-seconds)

Incorrect Mand Trial 3
Experimenter: “What sports have you played?”
Participant: “I play football and baseball.”
Experimenter: “Hey, me too!”
TIME DELAY (up to 5-seconds)
Participant: “Do you like horses?”
Experimenter: “We are talking about (topic) right now.” End trial

Correct Mand Trial 3
Experimenter: “What sports have you played?”
Participant: “I play football and baseball.”
Experimenter: “Hey, me too!”
TIME DELAY (5-seconds)
Participant: “Do you play baseball?”
Experimenter: “I play baseball sometimes.”
Experimenter: “I prefer basketball.” (SMALL TALK)

No Response Trial 4
Experimenter: “Where do you play baseball?” (QUESTION)
Participant: “I play in my yard” (ANSWER)
Experimenter: “I play at school.” (SMALL TALK)
TIME DELAY (up to 5-seconds)

Incorrect Mand Trial 4
Experimenter: “Where do you play baseball?”
Participant: “I play in my yard”
Experimenter: “I play at school.”
TIME DELAY (up to 5-seconds)
Participant: “Do you like horses?”
Experimenter: “We are talking about (topic) right now.” End trial
Correct Mand Trial 4
Experimenter: “Where do you play baseball?”
Participant: “I play in my yard”
Experimenter: “I play at school.”
TIME DELAY (5-seconds)
Participant: “Do you play football?”
Experimenter: “I play football sometimes.”
Experimenter: “It’s fun.” (SMALL TALK)
APPENDIX C
Example Conversations during Training

Conversation starter/directions
Experimenter: “Hello. I want you to ask me four questions about (topic) today. Okay?”
Participant: “Okay”

Correct Mand
Participant: “What is your favorite game to play?” (QUESTION)
Experimenter: “My favorite game to play is basketball” (ANSWER)
Experimenter: “It’s a lot of fun to play.” (SMALL TALK)
TIME DELAY

Incorrect Mand
Participant: Do you like horses?
Experimenter: “We are talking about (topic) right now. “Say…”Where do you play baseball?” (Prompt: either textual or echoic)
Participant: “Where do you play basketball?”
Experimenter: “I play basketball at school.”
Experimenter: “Lots of people play there.”
TIME DELAY

No Response
Participant: No response
Experimenter: “Say…“Where do you play baseball?” (Prompt: either textual or echoic)
Participant: “Where do you play basketball?”
Experimenter: “I play basketball at school.”
Experimenter: “Lots of people play there.”
TIME DELAY

The format examples displayed above will be applied to all questions in each stimulus set.

Stimulus Set 1: Food

Incorrect mand for information
Time delay
Participant: no response/incorrect mand
Experimenter: “Say, what are your favorite foods?” (Prompt: either textual or echoic)
Participant: “What are your favorite foods?” (Questions)
Experimenter: “I like pizza and pasta.” (Answer)
Experimenter: “Hamburgers are good too.” (Small Talk)
TIME DELAY
Participant: no response/incorrect mand
Experimenter: “Say, what did you eat for breakfast?”
Participant: “What did you eat for breakfast?”
Experimenter: “I had eggs and orange juice”
Experimenter: “Orange juice is good for you.”
TIME DELAY

Participant: no response/incorrect mand
Experimenter: “Say, what restaurants do you like to eat at?”
Participant: “What restaurants do you like to eat at?”
Experimenter: “I like to eat at Pizza Hut.”
Experimenter: “They have good pizza.”
TIME DELAY

Participant: no response/incorrect mand
Experimenter: “Say, what do you like to cook?”
Participant: “What do you like to cook?”
Experimenter: “I cook eggs for breakfast.”
Experimenter: “Breakfast is my favorite meal”

Stimulus Set 2: Games

Incorrect mand for information
Time delay
Participant: no response/incorrect mand
Experimenter: “Say, what is your favorite video game?”
Participant: “What is your favorite video game?”
Experimenter: “I like to play Mario cart.”
Experimenter: “I have played Mario since I was little.”
TIME DELAY

Participant: no response/incorrect mand
Experimenter: “Say, who do you play games with?”
Participant: “Who do you play games with?”
Experimenter: “I play with my brother mostly.”
Experimenter: “My friends come over sometimes too.”
TIME DELAY

Participant: no response/incorrect mand
Experimenter: “Say, where do you play video games?”
Participant: “Where do you play video games?”
Experimenter: “I play video games at my house.”
Experimenter: “I like to play in my room best.”
TIME DELAY

Participant: no response/incorrect mand
Experimenter: “Say, what sports do you play?”
Participant: “What sports do you play?”
Experimenter: “I like to play basketball and football.”
Experimenter: “I play with my friends.”

**Stimulus Set 3: School**

**Incorrect mand for information**

Time delay  
Participant: *no response/incorrect mand*

Experimenter: “Say, where do you go to school?”  
Participant: “Where do you go to school?”  
Experimenter: “I go to school at YSU.”  
Experimenter: “I like college.”

TIME DELAY

Participant: *no response/incorrect mand*

Experimenter: “Say, What is your teacher’s name?”  
Participant: “What is your teacher’s name?”  
Experimenter: “My teacher is Miss Rosales.”  
Experimenter: “She was my teacher for two years.”

TIME DELAY

Participant: *no response/incorrect mand*

Experimenter: “Say, what is your favorite subject?”  
Participant: “What is your favorite subject?”  
Experimenter: “My favorite subject is science.”  
Experimenter: “I do not like mathematics much.”

TIME DELAY

Participant: *no response/incorrect mand*

Experimenter: “Say, what do you want to be when you grow up?”  
Participant: “What do you want to be when you grow up?”  
Experimenter: “I want to be a teacher.”  
Experimenter: “I want to teach at YSU.”
**APPENDIX D**  
Data Sheet/Baseline

**Student initials:**__________  
**Date:**______________  
**Observer:**_______________________

1) Correct mand for information: Complete, multiple word, grammatically correct, and accurate questions.  
2) Incorrect mand for information: Incomplete question, repetition of a previously answered question (within the same trial) or nonsensical response (e.g., echolalia, unrelated, or bizarre speech).  
3) No mand for information: No emitted verbalization.

**Timer Period Collecting Data:**___________

**Stimulus set/prompt type:**__________________________

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<th>Correct mand</th>
<th>Incorrect mand</th>
<th>No mand</th>
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<td>total</td>
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</tr>
</tbody>
</table>
**Data Sheet/Training**

**Student initials:** ____________  
**Date:** ________________  
**Observer:** ____________________

1) Correct mand for information: Complete, multiple word, grammatically correct, and accurate questions.  
2) Incorrect mand for information: Incomplete question, repetition of a previously answered question (within the same trial) or nonsensical response (e.g., echolalia, unrelated, or bizarre speech).  
3) No mand for information: No emitted verbalization.

**Timer Period Collecting Data:** ________________

**Stimulus set/prompt type:** _____________________________________________

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<th>Incorrect mand</th>
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<th>Prompt time/type</th>
</tr>
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</tr>
<tr>
<td>total</td>
<td></td>
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</table>
## APPENDIX E

### Treatment Integrity Checklist

**Baseline Phase**

<table>
<thead>
<tr>
<th>(Mands for information)</th>
<th>Baseline phase</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Sits across the table from the student with all needed materials.</td>
<td>+</td>
<td>-</td>
<td>N/A</td>
</tr>
<tr>
<td>Provide instructions prior to beginning each stimulus set (“I am going to ask you some questions, and I want you to ask me four questions about (TOPIC) today.”).</td>
<td>+</td>
<td>-</td>
<td>N/A</td>
</tr>
<tr>
<td>After asking the student pre-selected questions, the experimenter waited five seconds before moving to the next question.</td>
<td>+</td>
<td>-</td>
<td>N/A</td>
</tr>
<tr>
<td>The experimenter answered all independent mands for information by the participant and provided small talk.</td>
<td>+</td>
<td>-</td>
<td>N/A</td>
</tr>
</tbody>
</table>
## Treatment Integrity Checklist
### Training Phase

<table>
<thead>
<tr>
<th>(Mands for information)</th>
<th>Training phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sat across from the student with all needed materials.</td>
<td>+</td>
</tr>
<tr>
<td>Provided instructions prior to beginning each stimulus set (“I am going to ask you some questions about (topic), and I want you to ask me four questions about (TOPIC) today.”).</td>
<td>+</td>
</tr>
<tr>
<td>Answered all independent mands asked by the student and provided small talk.</td>
<td>+</td>
</tr>
<tr>
<td>Utilized the correct prompt delay procedure interval (0-8 sec).</td>
<td>+</td>
</tr>
<tr>
<td>Prompted using correct prompt type (echoic or textual) after allotted delay interval had passed.</td>
<td>+</td>
</tr>
<tr>
<td>Utilized the correct prompt type for each stimulus set.</td>
<td>+</td>
</tr>
</tbody>
</table>
## Treatment Integrity Checklist
### Generalization Phase – Stimulus Set

**Student:**

**Date:**

**Observer:**

<table>
<thead>
<tr>
<th>(Mands for information)</th>
<th>Generalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sits across the table from the student with all needed materials.</td>
<td>+ - N/A</td>
</tr>
<tr>
<td>Provide instructions prior to beginning each stimulus set (&quot;I am going to ask you some questions, and I want you to ask me four questions about (TOPIC) today.&quot;).</td>
<td>+ - N/A</td>
</tr>
<tr>
<td>After asking the student pre-selected questions, the experimenter waited five seconds before moving to the next question.</td>
<td>+ - N/A</td>
</tr>
<tr>
<td>The experimenter answered all independent mands for information by the participant and provided small talk.</td>
<td>+ - N/A</td>
</tr>
</tbody>
</table>
## Treatment Integrity Checklist
### Generalization Phase – To Peer

**Student:**  
**Date:**  
**Observer:**

<table>
<thead>
<tr>
<th>(Mands for information) Generalization To Peer</th>
<th>+</th>
<th>-</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sat students across from each other with all needed materials.</td>
<td>+</td>
<td>-</td>
<td>N/A</td>
</tr>
<tr>
<td>Provided instructions prior to beginning each stimulus set (“We are going to have a 5 min conversation about (topic). I want you to ask each other 4 questions in the next 5 min.”)</td>
<td>+</td>
<td>-</td>
<td>N/A</td>
</tr>
<tr>
<td>Record correct mands only for the participant, not the peer.</td>
<td>+</td>
<td>-</td>
<td>N/A</td>
</tr>
<tr>
<td>Provide no prompts to the participant and only indirectly prompt (“Ask a question”) to the peer.</td>
<td>+</td>
<td>-</td>
<td>N/A</td>
</tr>
<tr>
<td>Indirect prompts to the student peer will only occur after 8 seconds of no verbal interaction</td>
<td>+</td>
<td>-</td>
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</tr>
<tr>
<td>No reinforcement will be delivered</td>
<td>+</td>
<td>-</td>
<td>N/A</td>
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Treatment Integrity Checklist
Follow-Up Phase

<table>
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<th>(Mands for information)</th>
<th>Follow up phase</th>
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</thead>
<tbody>
<tr>
<td>Sits across the table from the student with all needed materials.</td>
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<td>-</td>
<td>N/A</td>
</tr>
<tr>
<td>Provide instructions prior to beginning each stimulus set (“I am going to ask you some questions, and I want you to ask me four questions about (TOPIC) today.”).</td>
<td>+</td>
<td>-</td>
<td>N/A</td>
</tr>
<tr>
<td>After asking the student pre-selected questions, the experimenter waited five seconds before moving to the next question.</td>
<td>+</td>
<td>-</td>
<td>N/A</td>
</tr>
<tr>
<td>The experimenter answered all independent mands for information by the participant and provided small talk.</td>
<td>+</td>
<td>-</td>
<td>N/A</td>
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</tbody>
</table>
**Figure 1.** Number of correct independent mands (CIM) during all sessions across participants.
Figure 2. Individual and total trials to criterion per prompt type for all participants.
**Figure 3.** Individual and total trials to criterion per stimulus set topic for all participants.
Figure 4. Individual and total CIM emitted to the first stimulus set mastery criterion for all participants.
### Table 1. Steve’s IOA and PI data

#### Percent of session in which IOA data was collected

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Training</th>
<th>Generalization Stimulus Set</th>
<th>Generalization To Peer</th>
<th>Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Textual</td>
<td>0%</td>
<td>30%</td>
<td>100%</td>
<td>100%</td>
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<tr>
<td>Echoic</td>
<td>0%</td>
<td>27%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
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</table>

#### Percent of agreement by the experimenter scored by secondary observer during all phases

<table>
<thead>
<tr>
<th></th>
<th>Textual</th>
<th>Echoic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Training</td>
<td>92%</td>
<td>100%</td>
</tr>
<tr>
<td>Generalization Stimulus Set</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Generalization To Peer</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Follow-Up</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

#### Percent of trials in which PI data was recorded by a secondary observer

<table>
<thead>
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<th></th>
<th>Textual</th>
<th>Echoic</th>
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<tbody>
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<td>Baseline</td>
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<td>0%</td>
</tr>
<tr>
<td>Training</td>
<td>15%</td>
<td>7%</td>
</tr>
<tr>
<td>Generalization Stimulus Set</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Generalization To Peer</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Follow-Up</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

#### Percent of correctly implemented steps by experimenter during all phases

<table>
<thead>
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<th></th>
<th>Textual</th>
<th>Echoic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
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<td>Training</td>
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<td>100%</td>
</tr>
<tr>
<td>Generalization Stimulus Set</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Generalization To Peer</td>
<td>100%</td>
<td>100%</td>
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<tr>
<td>Follow-Up</td>
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</table>
Table 2. Wayne’s IOA and PI data

Percent of session in which IOA data was collected

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Training</th>
<th>Generalization Stimulus Set</th>
<th>Generalization To Peer</th>
<th>Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Textual</td>
<td>83%</td>
<td>50%</td>
<td>100%</td>
<td>100%</td>
<td>50%</td>
</tr>
<tr>
<td>Echoic</td>
<td>83%</td>
<td>40%</td>
<td>100%</td>
<td>100%</td>
<td>50%</td>
</tr>
</tbody>
</table>

Percent of agreement by the experimenter scored by secondary observer during all phases

<p>| | | | | | |</p>
<table>
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<tbody>
<tr>
<td>Textual</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Echoic</td>
<td>90%</td>
<td>100%</td>
<td>100%</td>
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</tr>
</tbody>
</table>

Percent of trials in which PI data was recorded by a secondary observer

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</thead>
<tbody>
<tr>
<td>Textual</td>
<td>30%</td>
<td>50%</td>
<td>100%</td>
<td>100%</td>
<td>50%</td>
</tr>
<tr>
<td>Echoic</td>
<td>30%</td>
<td>40%</td>
<td>100%</td>
<td>100%</td>
<td>50%</td>
</tr>
</tbody>
</table>

Percent of correctly implemented steps by the experimenter scored by secondary observer during all phases

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<tbody>
<tr>
<td>Textual</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Echoic</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
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</tr>
</tbody>
</table>
Table 3. Ivan’s IOA and PI data

Percent of session in which IOA data was collected

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Training</th>
<th>Generalization</th>
<th>Generalization</th>
<th>Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Textual</strong></td>
<td>33%</td>
<td>35%</td>
<td>100%</td>
<td>100%</td>
<td>50%</td>
</tr>
<tr>
<td><strong>Echoic</strong></td>
<td>33%</td>
<td>33%</td>
<td>100%</td>
<td>100%</td>
<td>50%</td>
</tr>
</tbody>
</table>

Percent of agreement by the experimenter scored by secondary observer during all phases

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<thead>
<tr>
<th></th>
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<th></th>
<th>Generalization</th>
<th>Generalization</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Textual</strong></td>
<td>100%</td>
<td>98%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Echoic</strong></td>
<td>100%</td>
<td>89%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Percent of trials in which PI data was recorded by a secondary observer

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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Textual</strong></td>
<td>33%</td>
<td>35%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Echoic</strong></td>
<td>33%</td>
<td>33%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Percent of correctly implemented steps by the experimenter scored by secondary observer during all phases

<p>| | | | | | |</p>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Textual</strong></td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Echoic</strong></td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>
November 27, 2012

Dr. Rocio Rosales, Principal Investigator
Mr. Matthew Swerdan, Co-investigator
Department of Psychology
UNIVERSITY

RE: HSRC PROTOCOL NUMBER: 054-2013
PROTOCOL TITLE: Manding for Information Maintained by Social Reinforcement: A Comparison of Prompting Procedures

Dear Dr. Rosales and Mr. Swerdan:

The Human Subjects Research Committee of Youngstown State University has reviewed the aforementioned protocol, and has approved it with the following conditions:

(1) Prior to starting any work with a child, you must consult with the child’s teacher to identify behaviors specific to each child which would indicate frustration during your training and assessment sessions. Further, you will not allow these behaviors to escalate more than a few seconds before initiating rests and you will stop a session if the behaviors last more than a minute or so (which would indicate the child is not consenting at that time).

(2) Prior to moving a child to the “quiet area of the school” where you will hold your research session, you will inform an administrator at the facility of where you are going if it is outside the child’s classroom.

(3) No data is collected on the peer child who participates in the social skills lesson unless parent consent and child assent is obtained for this child also.

Any changes in your research activity should be promptly reported to the Human Subjects Research Committee and may not be initiated without HSRC approval except where necessary to eliminate hazard to human subjects. Any unanticipated problems involving risks to subjects should also be promptly reported to the Human Subjects Research Committee.

Best wishes in the conduct of your study.

Sincerely,

Peter J. Kasvinsky
Dean, School of Graduate Studies
Research Compliance Officer

Karen Giorgetti, Chair
Department of Psychology