

**THE EFFECTS OF TRANSFER OF STIMULUS CONTROL PROCEDURES AND
PEER-MEDIATED INTERVENTION ON THE ACQUISITION AND
GENERALIZATION OF INTRAVERBALS FOR CHILDREN WITH AUTISM
SPECTRUM DISORDERS**

by

Buket Kisac

Bachelor of Science, Uludag University, Turkey, 2007

Master of Education, University of Pittsburgh, 2012

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This dissertation was presented

by

Buket Kisac

It was defended on

July 12, 2016

and approved by

Rachel E. Robertson, Assistant Professor, Department of Instruction and Learning

Douglas E. Kostewicz, Associate Professor, Department of Instruction and Learning

Benjamin L. Handen, Professor, Department of Psychiatry

Dissertation Advisor: Steven R. Lyon, Associate Professor, Department of Instruction and
Learning

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Intraverbals are a type of verbal behavior that occurs when a verbal stimulus evokes a verbal response that has no point-to-point correspondence or formal similarity with the verbal stimulus (Skinner, 1957). One teaching procedure used to establish intraverbal skills is transfer of stimulus control procedure. Although a number of research studies have shown that transfer of stimulus control procedures appeared to be effective in teaching intraverbals for children with ASD, the gains observed in the training did not transfer, or generalize, to other people and settings. That is, merely the use of transfer of stimulus control procedures did not yield the generalization of intraverbal responses. The literature on generalization has emphasized that generalization does not occur unless specific procedures such as programming common stimuli are also provided (Stokes & Osnes, 1989; Stokes & Baer, 1977).

In this study, the researcher investigated the effects of transfer of stimulus control procedures and a peer prompting procedure on the acquisition and generalization of intraverbals across peers without disabilities using a multiple baseline across three conversation scripts

design. Two children with ASD and four typically-developing children participated in this study. Upon the intervention, both participants demonstrated increased contextually-appropriate intraverbal responses in a few sessions. Results also indicated that the combined approach showed promising generalization outcomes related to increases in correct intraverbals. Additionally, both participants required decreased number of adult-delivered prompts to converse with their peers during peer prompting sessions, indicating that they would maintain social interaction in the teacher's absence. Considerations for interpretation and recommendations for future directions of this study are also discussed.

Keywords: Transfer of stimulus control procedures, peer-mediated intervention intraverbals, and children with autism spectrum disorder.

TABLE OF CONTENTS

1.0 INTRODUCTION.....	1
1.1 STATEMENT OF PROBLEM	5
2.0. LITERATURE REVIEW	7
2.1.1 Skinner’s verbal behavior	7
2.1.2. Intraverbal and stimulus control.....	9
2.1.3. The multiple control of intraverbals	11
2.1.4. Derived relational responding.....	13
2.1.5. Script fading procedures	15
2.1.6. Peer-mediated interventions	17
2.1.7. Transfer of stimulus control procedures.....	19
2.2. Research on transfer of stimulus control procedures.....	21
2.2.1. Methods.....	21
2.2.2. Results	22
2.2.2.1. Independent variables	23
2.2.2.2. Experimental designs.....	25
2.2.2.3. Dependent measures	27
2.2.2.4. Efficacy of transfer of stimulus control procedures	29
2.2.2.5. Maintenance and generalization	33

2.2.3. Discussion.....	35
2.2.3.1. Limitations of existing research	39
2.2.3.2. Future directions.....	41
2.2.3.3. Proposed study	42
3.0 METHODS	43
3.1 PARTICIPANTS	43
3.1.1. Conversation Partners.....	45
3.2 SETTING	47
3.3 MATERIALS.....	47
3.4. EXPERIMENTAL DESIGN	49
3.5. DEPENDENT VARIABLE	50
3.5.1 Number of correct intraverbal responses.....	50
3.5.2 Rate of adult-delivered prompts during peer-initiation condition	50
3.6. INDEPENDENT VARIABLE.....	51
3.7. PROCEDURE.....	52
3.7.1 Preference assessment.....	52
3.7.2. Intraverbal assessment	53
3.7.3. Baseline	53
3.7.4. Peer-initiation training.....	54
3.7.4.1. Section one.....	55
3.7.4.2. Section two.....	56
3.7.5. Transfer of stimulus control procedures.....	56
3.7.6. Peer prompter sessions	57
3.7.7. Data collection for Intraverbal probes.....	58

3.7.8.	Maintenance probes	59
3.7.9.	Generalization probes	60
3.7.10.	Inter-observer agreement	61
3.7.11	Procedural integrity	62
3.7.12.	Social validity.....	63
4.0	RESULTS	65
4.1	MSWO PREFERENCE ASSESSMENT.....	65
4.2	THE NUMBER OF CORRECT INTRAVERBAL RESPONSES.....	66
4.2.1	Jack.....	66
4.2.1.1	Conversation A.....	66
4.2.1.2	Conversation B.....	67
4.2.1.3	Conversation C.....	68
4.2.2	Darrel.	71
4.2.2.1	Conversation A.....	71
4.2.2.2	Conversation B.....	72
4.2.2.3	Conversation C.....	73
4.3	THE RATE OF ADULT-DELIVERED PROMPTS	75
4.3.1	Jack.....	75
4.3.2	Darrel	78
5.0	DISCUSSION.....	82
5.1	LIMITATIONS.....	89
5.2	IMPLICATIONS FOR PRACTITIONERS	90
5.3	FUTURE DIRECTIONS	91

5.4 CONCLUSIONS.....	92
APPENDIX A	96
APPENDIX B	98
APPENDIX C	101
APPENDIX D	104
APPENDIX E	107
APPENDIX F	109
BIBLIOGRAPHY.....	111

LIST OF TABLES

Table 1 : Participants	45
Table 2: Conversation Partners	46
Table 3: Average Inter-Observer Agreement for Intraverbals	62
Table 4: Average Intra-Observer Agreement.....	62
Table 5: Average Treatment Integrity Across Two Conditions.....	63
Table 6: Mean and Range of Teacher Ratings of Conversation Skills of Children with ASD and Their Peers	81
Table 7: Literature Review Summary.....	93

LIST OF FIGURES

Figure 1: Number of Correct Intraverbals for Jack.....	70
Figure 2: Number of Correct Intraverbals for Darrel.....	74
Figure 3: Teacher Prompts Per Minute for Jack	77
Figure 4: Teacher Prompts Per Minute for Darrel.....	79

1.0 INTRODUCTION

Language is a crucial way of interacting with others, and children begin to develop speech and language abilities during the first three years of life. By the time an infant is born, the baby begins to communicate needs through crying and cooing sounds (Whether, 2006). These beginning signs of communication are gradually followed by the use of words and non-verbal expressions, gestures, and other behaviors to express needs, share experiences, obtain information, and initiate or sustain conversation with others. Such speech and language development is often delayed or absent in children with autism spectrum disorders (ASD). Children with ASD experience a number of challenges in communication, including misunderstanding verbal and nonverbal communication, displaying poor responses to verbal instructions, and using stereotypical and repetitive language (APA, 2000). Difficulty using and understanding language, in turn, sets limits on opportunities for socialization and academic achievement (Sundberg, & Michael, 2001). Thus, researchers and educators should give high priority to communication deficits when developing intervention plans for children with ASD (Sunberg, & Michael, 2001).

Language interventions that have evolved from the science of Applied Behavior Analysis (ABA) have been shown to be effective in improving communication skills for children with ASD (National Autism Project, 2009; Prelock, Paul, & Allen, 2011). In his 1957 book, *Verbal Behavior*, B.F. Skinner demonstrates how the behavioral analytic approach can apply to

understanding and learning language (Tincani, Bondy, Crozier, 2011). Language is learned behavior, and it can be acquired and maintained by applying the same principles of learning that account for other types of behavior, such as reinforcement (Higbee & Sellers, 2011). Learning occurs through the controlling of variables such as antecedents and consequences within the environmental context. In contrast to the language theories focusing on the form or topography of language, Skinner provides an analysis of verbal behavior by its function rather than its structure or parts of speech (Greer, & Ross, 2008). Based on the functional properties of verbal behavior, Skinner outlined the elementary verbal operants—the units of language— as mand (requests), tact (labels), intraverbal (answers questions) and echoic (imitate others' sounds). In this paper, one of Skinner's verbal operants is reviewed: intraverbal.

Skinner (1957) described the intraverbal as a type of verbal behavior that occurs when a verbal stimulus evokes a verbal response that has no point-to-point correspondence or formal similarity with the verbal stimulus (e.g., answering “I am fine” when asked “How are you?”). In the early development of an intraverbal repertoire, a young child uses simple intraverbals such as singing songs and filling in words to simple phrases (e.g., saying “boo” in the presence of “Peek a...”). Then, more complex intraverbals are used in the form of answering questions (e.g., “What is your favorite movie” “When's your birthday?”) and stating members of categories (e.g., responding “zebra, elephant, and penguin” to “What are some animals you see at the zoo?”) (Sundberg, 2007).

The development of intraverbal skills is necessary for establishing and maintaining social interaction skills as well as for improvements in other skills (Sundberg, Endicott, & Eigenheer, 2000). For instance, conversational skills play a crucial role in establishing and maintaining peer relationships (Beaulieu, Hanley, & Santiago, 2014). Much of a child's conversation involves

intraverbal behaviors including answering social questions, responding to statements, making comments, and telling stories (Partington & Bailey, 1993). The improvement of such intraverbal behaviors may help children with ASD to engage in social interaction. Particularly, children with ASD who are educated in inclusive settings with their peers without disabilities can have opportunities to develop meaningful social relationships if effective instructional strategies to teach intraverbals are implemented. The ultimate goal with language training is for children to be able to communicate effectively with others, such as peers, in their natural environment. However, without appropriate interventions and specific support, children with ASD may be subject to social isolation, making integration into the school difficult (Bass & Mulick, 2007). Furthermore, if children with ASD do not receive effective intervention as early as possible, there can be a substantial gap between these children and their peers in language abilities. For these reasons, it is important to select effective interventions that will provide support and opportunities to apply learned language skills in inclusive settings.

Successful language interventions focusing on intraverbals implemented for children with ASD include transfer of stimulus control procedures (Braam & Polling 1983; Luciano 1986; Watkins, Pack-Texteris, & Howard, 1989), peer-mediated interventions (Kamps, Barbetta, Leonard, & Delquadri, 1994), video modeling (Sherer, Pierce, Paredes, Kisacky, Ingersoll, & Schreibman, 2001), script fading (Krantz, Zалenski, Hall, Fenske, & McClannahan, 1981; Wichnick, Vener, Pyrtek, & Poulson, 2010;), and derived relational responding procedures (Grannan & Rehfeldt, 2012; May, Hawkins, & Dymond, 2013; Miguel, Petursdottir, & Carr, 2005; Keintz, Miguel, Kao, & Finn, 2011; Petursdottir, Olafsdottir, & Aradottir, 2008). Although a variety of teaching procedures and practices have been used to improve intraverbals of children with ASD, the majority of researchers have reported that children with ASD are successfully

taught intraverbals using transfer of stimulus control procedures (Braam & Polling 1983; Luciano 1986; Sundberg, San Juan, Dawdy, & Arguelles 1990; Watkins, Pack-Texteris, & Howard, 1989). Transfer of stimulus control procedure involves bringing the response under the control of a stimulus or a response prompt with the naturally occurring stimuli. The task then is to transfer the target response from the control of the stimulus or the response prompt to natural stimuli (Cooper, Heron, & Heward, 2007).

Research has shown that transfer of stimulus control procedures have been shown to be effective for teaching intraverbals in individuals with language delays (Braam & Polling 1983; Luciano 1986; Sundberg, San Juan, Dawdy, & Arguelles 1990; Watkins, Pack-Texteris, & Howard, 1989) as well as in children with ASD (Kodak, T., Fuchtman, R., & Paden, A., 2012; Charlop-Christy & Kelso, 2003). However, one frequently noted concern with contrived language interventions for children with ASD is that the gains observed in the training do not transfer, or generalize, to other people and settings (Cowan & Allen, 2007). The literature on generalization has emphasized that generalization does not occur unless specific procedures are also provided (Stokes & Osnes, 1989; Stokes & Baer, 1977). Stokes and Baer (1977) proposed several tactics to promote generalization, and one of the tactics for generalization is programming common stimuli. Programming common stimuli or incorporating mediators involves using stimuli in training that will also occur in non-training conditions (Stokes & Osnes, 1989; Cowan & Allen, 2007). For example, using peer mediators to teach intraverbals may increase the likelihood that the acquired skills will generalize to other people and settings (Stokes & Baer, 1977). Additionally, using peers provides opportunities for direct interaction between children. In turn, this interaction may foster inclusion in general education classrooms (Chan, Lang, Rispoli, O'Reilly, Sigafos, & Cole, 2009).

In addition to transfer of stimulus control procedures, peer-mediated interventions (PMI) have been found to be effective to teach intraverbal behaviors (Krantz, Ramsland, & McClannahan, 1989; Bell, Young, Salzberg, & West, 1991; Kamps, Barbetta, Leonard, & Delquadri, 1994; Beaulieu, Hanley, Santiago, 2014; Cihon, 2007). In PMI, typical peers (e.g., classmates) model or prompt the targeted social behaviors (Chan et al, 2009; Watkins, O'Reilly, Kuhn, Gevarter, Lancioni, Sigafos, & Lang, 2014). Krantz, Ramsland, and McClannahan (1989) applied peer-prompting procedure, in which peers were employed as conversational initiators for children with disabilities, to increase the conversational speech of three children with ASD. Prior to training, the participants demonstrated very low frequencies of conversational speech. As the participants were introduced to the peer-prompting procedure, all participants increased their conversational language, and applied the acquired skills to group conversations, to a different setting and teacher, and to different dyads. More recently, Beaulieu, Hanley, and Santiago (2014) implemented peer-mediated behavioral skills training to teach conversational skills to an undergraduate student with a learning disability. The authors reported that the participant was able to maintain conversation with fewer interruptions, increased questioning, and increased positive feedback following the intervention. Moreover, the participant showed the conservation skills in new settings with new people.

1.1 STATEMENT OF PROBLEM

Several researchers have used peer-mediated interventions to increase intraverbal responses in the area of academic skills (Krantz, Ramsland, & McClannahan, 1989; Bell, Young, Salzberg, & West, 1991; Kamps, Barbetta, Leonard, & Delquadri, 1994; Beaulieu, Hanley,

Santiago, 2014; Cihon, 2007); however, few researchers have targeted intraverbal repertoire related to conversational skills (Beaulieu, Hanley, and Santiago 2014; Krantz, Ramsland, & McClannahan, 1989). Therefore, future researchers need to investigate instructional strategies that can promote the acquisition of conversational intraverbals for children with ASD. In addition, despite improvements in the acquisition of intraverbal behaviors when using contrived language interventions such as transfer of stimulus control procedures, a frequently noted issue is that teaching in tightly controlled situations may result in responding that is under the control of some specific stimuli, not under the control of all desired stimuli (Cowan, & Allen, 2007). For this reason, future studies should consider the addition of peer-mediated interventions, such as peer-prompters, for the transfer of stimulus control procedures to promote generalization of intraverbals in inclusive settings. Thus, the purpose of this study is to evaluate the effects of transfer of stimulus control procedures (i.e., verbal prompts and a constant time delay) and the peer-prompter procedure on the acquisition and generalization of intraverbals in inclusive settings.

2.0. LITERATURE REVIEW

Given that a delayed intraverbal repertoire may affect the improvement of social skills in children with ASD, the development of intraverbal repertoire is of considerable importance to practitioners (Partington & Bailey, 1993). To deliver effective interventions to improve intraverbals for children with ASD, Skinner's analysis of language may provide a guide for educators to understand variables that relate to the control of language, specifically intraverbals.

2.1.1 Skinner's verbal behavior

In his 1957 book, *Verbal Behavior*, B.F. Skinner demonstrates how the behavioral analytic approach can apply to understanding and learning language (Tincani, Bondy, Crozier, 2011). He defined verbal behavior as "behavior reinforced through the mediation of other persons' needs" (Skinner, 1957, p.2). From this definition, four important defining features of verbal behavior can be drawn. First, a speaker's behaviors are reinforced through a listener's actions within the speaker's environment, rather than by the environment directly. That is, verbal behavior does not occur by a simple environment-based operant behavior, rather it requires the mediation of another person (Bailey & Wallander, 1999). Second, language is learned behavior, and it can be acquired and maintained by applying the same principles of learning that account for other types of behavior, such as reinforcement (Higbee & Sellers, 2011). Learning occurs

through the controlling of variables such as antecedents and consequences within the environmental context. For instance, when there is a plane, a child sees it, and says “plane”. A caregiver respond him by saying “That is right, it is a plane.” This instance of verbal behavior is controlled by a nonverbal discriminative stimulus (i.e., plane) and maintained by generalized conditioned reinforcement (i.e., praise or approval) (Sundberg, 2007, 2008; Higbee & Sellers, 2011).

Third, Skinner provides an analysis of verbal behavior by its function rather than its structure or parts of speech (Greer, & Ross, 2008). From the language theories focusing on the form or topography of language, language acquisition is the function of innate development. If there is a delay or deficit in using language, then the deficit is said to be caused by neurological abnormalities. To teach language, such approach targets teaching the forms of language—sounds, words, and grammatical structures—while giving little regard for functions of these forms (Tincani, Bondy, & Crozier, 2011). Due to the fact that language involves the use of words, sounds, and grammar, and without them language would not occur (Greer, & Ross, 2008), it is important to understand the form of verbal behavior. However, the form of verbal behavior does not tell us why and under what circumstances verbal behavior occurs (Tincani, Bondy, & Crozier, 2011). For instance, a child who cannot reach for cookie can ask for it by talking, and a caregiver can respond by giving it to him; this is a request function or mand by the child whose behavior is reinforced by the caregiver delivering the cookie. If the child says “cookie” and the child’s response does not affect the behavior of the caregiver in the interest of the child, then the form will be present, but the function will be absent (Greer, & Ross, 2008). Such lack of functional verbal behavior does not give the child control over the environment and interactions with others (Higbee, & Sellers, 2011). For this reason, it is important to understand

the functional control of verbal behavior. A contingency analysis of verbal behavior can help teachers and professionals understand the sources of verbal functions and how to manipulate them to establish functional use of verbal behavior when it is missing (Tincani, Bondy, & Crozier, 2011; Greer, & Ross, 2008).

Fourth, verbal behavior does not need to be vocal since Skinner's classification of verbal behavior is functional rather than structural (Sundberg, 2007). Behaviors such as pointing to a car, crying, and gesturing for attention can be identified as verbal behavior. When a child cries for attention, an adult becomes aware of the child's behavior and gives attention. Verbal behavior occurs between the child and the adult and the behavior is reinforced through the adult's action. In other words, verbal behavior involves the establishment of social interaction between a speaker and a listener whereby the speaker changes the behavior of the listener (e.g., the listener turns his/her head towards the speaker) and gains access to reinforcement (e.g., the speaker gets attention) (Sundberg, 2007; Catania, 1998 p.262).

Based on the functional properties of verbal behavior, Skinner outlined the elementary verbal operants—the units of language— as mand, tact, intraverbal, echoic, textual, and transcription. In this paper, one of Skinner's verbal operants is reviewed: intraverbal.

2.1.2. Intraverbal and stimulus control.

Skinner (1957) described the intraverbal as a type of verbal operant that occurs when a verbal stimulus evokes a verbal response that has no point-to-point correspondence or formal similarity with the verbal stimulus. For example, if someone asks "How old are you?" the tendency to say "I am ten years old" is a type of verbal behavior where the words of others function as a verbal discriminative stimulus for other words. That is, "How old are you?" evokes

the response, “I am ten years old”, due to a verbal conditioning history (Sundberg & Sundberg, 2011). The intraverbal repertoire can be developed in the form of singing songs, telling stories, and describing activities (Sundberg & Michael, 2001).

When a specific verbal discriminative stimulus reliably produces an intraverbal behavior, then the behavior appears to be under stimulus control (Cooper, Heron, & Heward, 2007). Stimulus control means that specific stimuli exert control over the behavior as a result of prior reinforcement (Cooper et al., 2007). The goal of establishing stimulus control is to make the student perform the target behavior consistently in the presence of the desired stimulus (Wolery, Ault, & Doyle, 1992). Stimulus control can be established when a given response is repeatedly reinforced in the presence of the target stimulus (Wolery et al., 1992). An example of intraverbal stimulus control is saying “Hi” when someone says “Hello”. The presence of another person who says “Hello” has acquired stimulus control over the response of “Hi” through differential reinforcement. Typically developing children respond to antecedent stimuli such as “Hello” without direct instruction. However, a child with ASD may not respond to peers when greeted because the naturally occurring stimulus (i.e., a peer says “hello”) does not yet control the response (MacDuff et al., 2001). Children with ASD may need additional stimuli, known as prompts, to learn how to respond to antecedent stimuli (Wolery & Gast, 1984). Prompts increase the probability that behaviors will be acquired and reinforced in the presence of naturally occurring stimuli (Snell & Brown, 2011). Given the importance of using intraverbals independently, without assistance from others, prompts need to be faded out in such a manner that children gradually learn to respond appropriately to the natural cues (MacDuff et al., 2001).

2.1.3. The multiple control of intraverbals

Skinner pointed out that “any sample of verbal behavior will be a function of many variables operating at the same time” (Skinner, 1957, p.228). That is, all verbal behavior occurs under multiple sources of control rather than a single source of control such as a discriminative stimulus or the presence of an adult (Sundberg, 2007). For the multiple control of intraverbal relations, stimulus control can be analyzed in terms of convergent multiple control and divergent multiple control (Axe, 2008; Michael, Palmer, & Sundberg, 2011). Convergent control occurs when more than one variable evokes a response (Michael, Palmer, & Sundberg, 2011). A response “Frog” after hearing, “What is a green animal?” is evoked by convergent multiple stimuli: “green” and “animal.” Divergent control, in contrast to convergent control, occurs when a single response evokes many related responses (Michael, Palmer, & Sundberg, 2011). For instance, divergent multiple control exists if someone emits many different intraverbal responses such as “banana, zoo, and animal” as a result of hearing “monkey.” Most intraverbals are evoked by either convergent multiple control or divergent multiple control; however, children with ASD often fail to emit intraverbals controlled by multiple stimuli (Axe, 2008; Sundberg & Sundberg, 2011; Eikeseth & Smith, 2013).

The reason why children with ASD have difficulty using intraverbals effectively or produce rote intraverbal responses may be related to the fact that intraverbals often involve highly complex verbal stimulus control, including discriminated operants, compound verbal stimuli, and conditional discriminations (Axe, 2008; Sundberg, & Sundberg, 2011; Eikeseth, & Smith, 2013). A discriminated operant occurs when a behavior comes under the control of a discriminative stimulus (e.g., a discriminated operant exists if a child says “ball” in the presence of the ball: the object of ball is the discriminative for saying “ball”) In a conditional

discrimination, one stimulus condition determines the function of another stimulus as a discriminative stimulus or a discriminative delta (Catania, 1998). The conditional discrimination occurs when a child who has a blue shirt stands up after someone says, “if you are wearing blue shirt, stand up.” (“If you are wearing blue shirt” determines the function of the response: “stand up.”) (Axe, 2008). In compound stimuli, more than two stimuli or two or more elements of a stimulus evokes a response (Eikeseth, & Smith, 2013). An example of a compound stimuli is when the child responds by stomping feet quickly, stomping feet slowly and knocking table quickly in response to the given demand; “show me stomping feet fast,” “show me stomping feet slowly,” and “show me knocking table fast,” respectively. To give a correct response, the child needs to discriminate two elements of the stimulus compound (i.e., stomp or knock, and fast or slow) (Eikeseth, & Smith, 2013).

Intraverbals controlled by multiple stimuli require children to attend to multiple verbal stimuli simultaneously and make conditional discriminations among those verbal stimuli to give a correct intraverbal response (Axe, 2008; Sundberg, & Sundberg, 2011; Eikeseth, & Smith, 2013). Because children with ASD have difficulty responding to multiple cues at the same time (Lovaas, Koegel, & Schreibman, 1979), they display delays in using intraverbals evoked by either convergent or divergent control. In a simple discrimination in the intraverbal relation, only one verbal stimulus controls a child’s response, such as responding “popcorn” when asked “What do you eat?” However, in a conditional discrimination in the intraverbal relation, more than one verbal stimulus evokes the correct response. For example, if a person asks “What do you eat that is red?” a correct response can be “strawberry” or “cherry” etc. But a conditional discrimination does not occur if the student’s answer comes under the control of only one verbal stimulus, such as saying “popcorn” as a response to only “eat,” and not the rest of the question

(What do you eat that is red?). A correct response requires the student to discriminate both verbal stimuli: “eat” and “red.” (Axe, 2008).

2.1.4. Derived relational responding

Derived relational responding refers to learned skills or behaviors that have not been explicitly reinforced in the individual’s history (Rehfeldt & Barnes-Holmes, 2009). During a derived relational responding procedure, an individual is first trained on a series of conditional discriminations with arbitrary stimuli. Then, the stimuli involved often become related to each other without being specifically trained (Torneke, 2010; May, Hawkins, & Dymond, 2013). For instance, a child who is taught to say “cup” learns that another word for cup is a glass. From learning these stimuli relations, whenever the child hears the word “glass” he will probably think of the word “cup,” and an actual cup as well. After that, hearing the word “glass” can make the child think of the actual cup, although the child has never been trained directly for making relations between the word “glass” and the actual cup.

Barner-Holmes, Barnes-Holmes, and Cullinan (2000) suggest that the combination of a synthesis of Skinner’s verbal behavior and derived relational responding may facilitate the acquisition of language in children with language delays. More often, researchers have provided explicit instruction to teach children with ASD how to use language by applying behavioral principles, including differential reinforcement, shaping, fading, extinction, and stimulus control to the acquisition of the target responses (Sundberg & Partington, 1998). However, derived relation responding research may have potential for developing communication skills that were never directly taught or reinforced (Rehfeldt & Barnes-Holmes, 2009). For this reason, several researchers have examined the use of relational framing on the emergence of untaught

communication skills in children with language deficits (Grannan & Rehfeldt, 2012; May, Hawkins, & Dymond, 2013; Vallinger-Brown & Rosales, 2014; Fiorile & Greer, 2007; Nuzzolo-Gomez & Greer, 2004; Keintz, Miguel, Kao, & Finn, 2011; Petursdottir, Olafsdottir, & Aradottir, 2008).

A number of researchers have studied emergent stimulus equivalence involving intraverbals using a variety of procedures: tact training (Grannan & Rehfeldt, 2012; May, Hawkins, & Dymond, 2013), multiple exemplar instruction (e.g., Fiorile & Greer, 2007; Nuzzolo-Gomez & Greer, 2004), and match-to-sample or listener training (Miguel, Petursdottir, & Carr, 2005; Keintz, Miguel, Kao, & Finn, 2011; Petursdottir, Olafsdottir, & Aradottir, 2008). In a tact training procedure, the students are taught to name a specific object or item depicted in a picture card and are then tested for the emergence of novel intraverbal responses. Multiple exemplar instruction is another strategy used to teach intraverbals without direct instruction. It involves teaching different response topographies (e.g., writing and spelling of words) to a subset of stimuli in an alternating way leading to joint stimulus control (i.e., a single stimulus evokes two different responses) for responses to untrained stimuli taught as a single response (Fiorile & Greer, 2007; Nuzzolo-Gomez & Greer, 2004). In a match-to-sample procedure or listener behavior training, when given an array of stimuli and provided a demand (e.g., touch to the one you use to wash your hands), the students are required to select the correct stimulus among the presented stimuli (Vallinger-Brown & Rosales, 2014).

The procedures outlined previously have demonstrated efficacy for the emergence of untaught intraverbal responses in children with ASD without further teaching (Vallinger-Brown & Rosales, 2014). For instance, May, Hawkins, and Dymond (2013) evaluated the emergence of novel intraverbal responses using tact training with three individuals with ASD. The

investigators taught the participants to label the name of a cartoon character (e.g., “What is the name of this monster?”) and that character’s favorite food (e.g., “What food does this monster eat?”). After tact training, in the absence of pictures, May et al. (2013) tested whether the participant could label the name of the character when given the food preference (e.g., “Which monster eats apple?”) and label the name of the food when given the character name (e.g., “What food does Rocky eat?”). All three participants demonstrated emergence of novel intraverbal responses following mastery of the trained relations. Similarly, Grannan and Rehfeldt (2012) examined the emergence of intraverbal responses (e.g., “What are four body parts?”) using category tact (e.g., “What is a ear?”) and match-to-sample instruction (i.e., matching the picture cards according to categories) in two children with ASD. The researchers found that the participants used a variety of intraverbal responses following category tact and match-to-sample procedures. Although in all of these noted investigations the researchers reported successful emergence of untrained intraverbals as a result of derived relational responding procedures, further research is needed to understand the effects of these procedures on the acquisition of intraverbals.

2.1.5. Script fading procedures

Script fading is a teaching procedure designed to increase the spontaneous and generalized use of language among children with ASD (Spencer, & Higbee, 2012). In script fading procedure, children are first taught to use written scripts or audio recordings. Following successful script training procedures, the scripted phrase or sentence is gradually faded back to front to help children use scripts when they are not present (Spencer, & Higbee, 2012).

Several researchers have examined the effect of script fading for the development of communication skills of children with ASD, including intraverbals in the form of responding to statements and question answering (Krantz, Zaleski, Hall, Fenske, & McClannahan, 1981; Wichnick, Vener, Pyrtek, & Poulson, 2010; Charlop-Christy & Kelso, 2003). Using a multiple baseline across participants, Wichnick et al. (2010) assessed the effects of script fading on teaching three children with ASD to respond to peer initiations. During the script training, the researchers used voice-over-recording devices with pre-recorded scripts that were placed in 10 bags containing pairs of toys. After the peer handed the bag containing a toy and a voice-over-recording device to a participant, the researcher gave prompts to make the participant listen to the recording device and use the pre-recorded script (e.g., "I love animals."). As the children began to use the scripts during peer interactions, the scripts were gradually faded from end to beginning. The results yielded that all participants demonstrated increased rates of peer initiations in the absence of scripts and they displayed novel responses to peer initiations. In addition, using a cue card/written script program, a Charlop-Christy and Kelso (2003) taught three children with ASD to answer conversational questions. During the intervention, the researchers presented the child with a cue card upon which a question and a response was written. When presented a conversational question such as "Do you like to draw?" they provided the script to evoke the correct response. The script, then, was faded to bring independent responses. The data gathered revealed that all three children were able to answer conversational questions following the script fading procedure. In addition, the authors concluded that the three children generalized responding to untrained topics across people and setting. Although a number of researchers have evaluated the effects of script fading procedure on the acquisition of communication skills for children with ASD, only a few of researchers have attempted to teach

intraverbals using this procedure. Therefore, additional research is needed on teaching intraverbals by the use script fading procedures.

2.1.6. Peer-mediated interventions

Peer-mediated interventions (PMI) have been found to be effective to teach intraverbal behaviors (Krantz, Ramsland, & McClannahan, 1989; Bell, Young, Salzberg, & West, 1991; Kamps, Barbetta, Leonard, & Delquadri, 1994; Beaulieu, Hanley, Santiago, 2014; Cihon, 2007). In PMI, typical peers (e.g., classmates) model or prompt the targeted social behaviors (Chan et al, 2009; Watkins, O'Reilly, Kuhn, Gevarter, Lancioni, Sigafos, & Lang, 2014). Krantz, Ramsland, and McClannahan (1989) evaluated the effects of peer-prompting procedure, in which peers were employed as conversational initiators for children with disabilities, in increasing the conversational speech of three children with ASD using a multiple baseline design across participants. Before the training, the peer was taught how to prompt participants to engage in sports conversations using a role-play strategy. The researchers taught the peer five target questions that were relevant to three sports: basketball, football, and baseball (e.g., “What is your favorite baseball team?”). In addition, the peer prompter learned a variety of “all-purpose” words and phrases that could be used to maintain conversation (e.g., “really?” and “then what happened?”). During the intervention, the participants and the peer prompter were instructed to listen to an audiotaped presentation about baseball, football, and basketball. After listening to the audiotapes, the researcher directed the peer prompter and one of the participants to talk for a few minutes about sports. The experimenter used a time sampling procedure in which he/she scored the occurrence and nonoccurrence of answering questions or responding to statements in each of the 30, 10-second intervals. None of the participants were able to engage in conversation about

sports during the baseline. Following the peer prompter training, all participants increased their conversational language, and applied the acquired skills to group conversations, to a different setting and teacher, and to different dyads.

Recently, using a multiple baseline design across behaviors, Beaulieu, Hanley, and Santiago (2014) assessed peer-mediated behavioral skills training to teach conversational skills to an undergraduate student with a learning disability. Peers without disabilities were instructed to ask a variety of questions about both one predetermined participant-preferred topic and one participant-non-preferred topic. During behavioral skills training, the peers provided a brief explanation of the following skills: listener role (if a peer is speaking, the participant listens silently or engages in positive feedback), positive feedback (the participant uses verbal or nonverbal language while the peer is talking), interrupting (the participant initiates conversation while the peer is talking), and questioning (the participant asks for clarification or information from the peer). After a brief description of the target behaviors, the peer modeled examples and non-examples of correct performance, practiced the behaviors with the participant, and provided feedback on the participant's performance. Following peer-implemented behavioral skills training, the participant was able to maintain conversation with fewer interruptions, increased questioning, and increased positive feedback. Moreover, the participant showed the conservation skills in new settings with new people.

Although several researchers have reported that peer-mediated interventions have lead to the acquisition of intraverbal responses in children with ASD (Krantz, Ramsland, & McClannahan, 1989; Bell, Young, Salzberg, & West, 1991; Kamps, Barbetta, Leonard, & Delquadri, 1994; Beaulieu, Hanley, Santiago, 2014; Cihon, 2007), the majority of researchers have focused on intraverbal repertoire in academic skills instead of conversational skills

(Beaulieu, Hanley, and Santiago 2014; Krantz, Ramsland, & McClannahan, 1989). Therefore, future researchers need to investigate instructional strategies that can promote the acquisition of conversational intraverbals for children with ASD.

2.1.7. Transfer of stimulus control procedures

A common method used to help children with ASD perform the behaviors independently in the presence of the desired stimulus is transfer of stimulus control (Sundberg & Partington, 1998). In transfer of stimulus control procedures, a new behavior is taught under a supplementary stimulus or a prompt and then, the transfer from the supplementary stimulus to the target discriminative stimuli occurs by using prompt fading procedures (Cooper et al., 2007). Researchers have attempted to use vocal (i.e., using words to show the student how to respond), textual (i.e., writing the correct answer on a text card that students are expected to read), and visual prompts (i.e., using pictures to show the student how to respond) along with the use of response fading procedures to teach intraverbals (Partington & Bailey 1993; Miguel, Petursdottir, & Carr, 2005). These fading procedures include time delay, most-to-least prompts, system of least prompts, and graduated guidance. Time delay involves inserting a time delay between the task stimuli and a response prompt. The most-to least prompts procedure refers by decreasing the assistance from the most intrusive prompt level to the least intrusive prompt level. In contrast, the system of least prompts procedure involves increasing the assistance from the least intrusive prompt to the most intrusive prompt to make the student respond correctly. Finally, graduated guidance means gradually fading physical assistance until the desired stimulus being taught controls the response (Snell & Brown, 2011, Wolery & Gast, 1984; Wolery et al., 1992).

Research has shown that transfer of stimulus control procedures can be effective for teaching intraverbals in individuals with language delays (Braam & Polling 1983; Luciano 1986; Sundberg, San Juan, Dawdy, & Arguelles 1990; Watkins, Pack-Texteris, & Howard, 1989) and typically developing children (Partington & Bailey 1993; Miguel et al., 2005). Braam and Polling (1983) conducted two experiments to examine the use of transfer of stimulus control procedures for teaching examples of category-type intraverbals in two children with intellectual disabilities. The researchers used a procedure which transfer control of a manual sign, such as an apple, from a picture of the stimulus to the verbal stimulus. The picture prompt was faded out by increasing the delay between the verbal stimulus and the delivery of picture prompts. The results showed that the percentage of correct intraverbal responses increased following the teaching procedures. In addition, Luciano (1986) replicated the Braam and Polling (1983) study, and the results were consistent. Transfer of stimulus control procedures (tact-to-intraverbal) and prompt delay resulted in high levels of intraverbal responses in three children with intellectual disabilities. Although the effective and efficient procedures for the transfer of stimulus control have been investigated with other populations, only a few of researchers have investigated whether these procedures are effective for teaching intraverbals in children with ASD. Moreover, limited research on effective transfer methods (i.e., tact-intraverbal, echoic-intraverbal, textual-intraverbal) used for learners with ASD pose a challenge when attempting to develop effective instruction to establish intraverbals. For these reasons, it is important to gain understanding of effective transfer stimulus control procedures used to teach intraverbals for children with ASD.

2.2. RESEARCH ON TRANSFER OF STIMULUS CONTROL PROCEDURES

The purpose of this literature review is to analyze and synthesize the previous research on the use of transfer of stimulus control procedures for teaching intraverbal skills in children with ASD. Through this review, the following research questions are proposed.

1. In the literature, what transfer of stimulus control procedures have researchers implemented?
2. What effect does the use of transfer of stimulus control procedures have on teaching intraverbal skills to children with ASD?
3. What kinds of intraverbal skills are targeted and how are they measured?
4. What effect does transfer of stimulus control procedures have on maintenance and generalization of intraverbals?

2.2.1. Methods

A search for existing literature on the effects of transfer of stimulus control procedures on the acquisition of intraverbals was conducted through Psychinfo and ERIC databases. Descriptors used were “intraverbal,” “transfer of stimulus control,” and “autism.” After articles meeting inclusion criteria were obtained, an ancestral search was conducted to identify further studies. In addition, a hand search of *the Analysis of Verbal Behavior* and *Journal of Applied Behavior Analysis* was completed. To meet inclusion criteria, all authors had to:

1. Be published in English and in a peer-reviewed journal.
2. Include experimental group-or single-subject design.
3. Include participants who have autism spectrum disorders (ASD).

4. Examine the effectiveness of transfer of stimulus control procedures in the acquisition of intraverbal responses.

The computerized search resulted in 4991 articles of which 10 relevant articles met inclusion criteria (Vedora, Meunier, & Mackay, 2009; Ingvarsson & Hollobaugh, 2011; Finkel & Williams, 2001; Goldsmith, LeBlanc, & Sautter, 2007; Ingvarsson, Cammilleri, & Marcias, 2012; Ingvarsson & Hollobaugh, 2010; Valentino, Shillingsburgh, & Call, 2012; Humphreys, Polick, Howk, Thaxton, & Ivancic, 2013; Emmick, Cihon, & Eshleman, 2010) A hand research of the journal *Analysis of Verbal Behavior* resulted in identification of one additional study (Ingvarsson & Le, 2011), but no additional article resulted from the ancestral search. Overall, 10 articles met all of the article inclusion criteria.

2.2.2. Results

This review examined research on the effectiveness of transfer of stimulus control procedures for children with ASD ages two through 21 that target the acquisition of intraverbal behaviors. Participants in these studies ranged in age from three to 15 years old. Three out of 10 authors recruited children under the age of five to participate in their studies (Humphreys et al., 2013; Ingvarsson & Le, 2011; Ingvarsson & Hollobaugh, 2011). The remaining seven studies examined the effects of transfer of stimulus control procedures with children ages six through 15 (Valentino et al., 2012; Finkel & Williams, 2001; Goldsmith et al., 2007; Vedora et al., 2009; Emmick et al., 2010; Ingvarsson & Hollobaugh, 2010; Ingvarsson et al., 2012). A demographic description of the articles is contained in Table 8. All of the studies investigated the efficacy of transfer of stimulus control procedures to teach intraverbals in children with ASD.

2.2.2.1. Independent variables

It is important for researchers and educators to understand which independent variables (e.g., transfer of stimulus control procedures) have an impact on behavior change in order to determine effective teaching procedures. In the reviewed literature, each of the studies reported using some form of transfer of stimulus control procedures to improve intraverbals of individuals with ASD. Of the 10 studies, five authors compared the effectiveness of different prompt types (Finkel & Williams, 2001; Ingvarsson & Le, 2011; Vedore, Meunier, & Mackay, 2009; Ingvarsson & Hollobaugh, 2011; Ingvarsson, Cammilleri, & Marcias, 2012). Two sets of authors compared the use of echoic (i.e., vocal) and textual (i.e., written) prompts on the establishment of intraverbal responses (Finkel & Williams; Vedora et al., 2009). In the textual prompt condition, the researchers provided scripted textual prompts to teach the participants how to answer the questions. In the echoic prompt condition, the researchers taught the participants to answer the questions through the use of verbal assistance. Ingvarsson and Hollobaugh (2011) and Ingvarsson et al. (2012) assessed the effectiveness of visual versus echoic prompts to teach intraverbals. In addition to using echoic prompts, the researchers used pictures of the intraverbal responses to help the participants answer the questions correctly. All three prompts (i.e., echoic, textual, and visual) for the acquisition of intraverbal responses in four children with ASD were investigated by Ingvarsson and Le (2011).

Unlike the prompt comparison studies, two sets of authors examined to what extent the use of a specific prompt type was effective in teaching intraverbals. Goldsmith et al. (2007) investigated whether or not visual prompts had an effect on learning categorical intraverbals in three children with ASD. In the Ingvarsson and Hollobaugh (2010) study, four participants with

autism were taught via echoic prompting to say “I do not know please tell me” (IDKPTM) to unknown questions.

The remaining three investigators combined transfer of stimulus control procedures with additional interventions (e.g., fluency instruction), different instructional prompts (e.g., a modeled prompt), or additional components to the intervention (e.g., repeated discriminative stimulus) (Emmick et al., 2010; Valentino et al., 2012; Humphreys et al. 2013). Emmick et al. (2010) examined whether or not transfer of stimulus control procedures and fluency training would lead to the acquisition of intraverbals in three children with ASD. Fluency refers to performing the behavior with the appropriate combination of accuracy and speed (Binder, 1996). The participants, in this study, reached an accurate and rapid rate on reading the target textual responses before the use of textual prompting. Then, the researchers used those scripted textual prompts to help the participants answer questions correctly. Valentino et al. (2012) reported the use of echoic prompts and a modeled prompt in the form of sign language to teach intraverbals. For the echoic prompt and modeled prompt condition, following the verbal discriminative stimulus (e.g., “What do you swim in?”), the echoic prompt (e.g., “pool”) concurrent with the relevant modeled prompt (e.g., the therapist moved two hands in a swimming motion based on the American Sign Language sign for swimming) were presented to evoke correct intraverbal responses. Humphreys et al. (2013) studied the use of the least-to-most prompting plus repeated discriminated stimulus. The researchers compared this to the least-to-most prompting without repeated discriminated stimulus to determine the relative effect of each experimental condition. In the condition of least to most prompting with repeated discriminated stimulus, the researchers delivered a partial-word prompt (e.g., “What animal waddles? D-“) after presentation of the initial discriminative stimulus. Following incorrect or no response within 5s, the discriminative

stimulus was given in conjunction with a full-word prompt (e.g., “What animal waddles? Duck”). For the condition of non-repeating discriminative stimulus, the researchers delivered the discriminative stimulus once, thus an incorrect or no response within 5s produced either a partial-or full-word prompt.

The researchers employed different response fading procedures in order to minimize prompt dependency in learners with ASD. The majority of them used either a 5-s constant time delay procedure (Ingvarsson & Hollobaugh, 2011; Ingvarsson & Le, 2011; Ingvarsson & Hollobaugh, 2010; Ingvarsson et al., 2012) or a 3-s constant time delay (Goldsmith et al., 2007). In the constant time delay, the researchers systematically faded the prompt by inserting a fixed amount of time between the question and the prompt. In addition to the constant time delay, Goldsmith et al. (2007) included other manipulations including, differential reinforcement of independent responses and using schedule thinning (i.e., thinning reinforcement schedule from fixed ratio 1 to fixed ratio 4). Finkel and Williams (2001) and Emmick et al. (2010) implemented a backward chain fading procedure for textual prompts. The researchers faded textual prompts by gradually removing words from the last word to the first. In the study of Vedora et al. (2009), a progressive prompt delay ranged from 0-s to 5-s was used to facilitate the transfer of stimulus control from the prompt to the verbal stimulus. The authors gradually increased the time delay between the questions and prompt from zero to five seconds. Additionally, all authors reported the use of prompting procedures in conjunction with reinforcement and error correction procedures.

2.2.2.2. Experimental designs

In the literature, researchers used a variety of different single subject designs to examine the effectiveness of transfer of stimulus control procedures. Single subject designs provide a

systematic and detailed analysis of individual performance across baseline and treatment. This establishes functional relations between independent and dependent variables (Tankersley, Harjusola-Webb, & Landrum, 2008). In the majority of these studies, researchers sought to understand the relative effect of one form of transfer of stimulus control procedures compared with another form of procedures on the of acquisition intraverbals. Thus, seven sets of authors employed an alternating treatments design to compare either the effects of various types of prompts (Vedora et al., 2009; Ingvarsson & Hollobaugh, 2011; Ingvarsson & Le, 2011) or the effects of additional intervention components on teaching intraverbals (Humphreys et al., 2013; Valentino et al., 2012; Emmick et al., 2010). Vedora et al. (2009) used an adapted alternating treatments design to evaluate whether textual prompts or echoic prompts led to the faster acquisition of intraverbals. Similarly, the effects of picture and echoic prompts were compared on teaching intraverbals using an adapted alternating treatments design by Ingvarsson and Hollobaugh (2011) and Ingvarsson et al. (2012). In addition, Ingvarsson and Le (2011) used an adapted alternating treatments design to assess the effects of textual, visual, and echoic prompts on the acquisition of intraverbals.

Transfer of stimulus control procedures in the following studies were accompanied by the use of additional strategy; different prompt type, and additional components. Using an adapted alternating treatments design embedded in a concurrent multiple probe design, Humphreys et al. (2013) assessed to what extent the least to most prompting with repeated discriminative stimulus versus no repeated discriminative stimulus impacted the acquisition of intraverbals. Emmick et al. (2010) employed an alternating treatments design to compare the relative effects of two conditions, textual prompting plus reading fluency versus textual prompting only, to understand under which condition the participants acquired the intraverbals faster. Valentino et al. (2012)

chose to employ a modified alternating treatments design with a repeated A-B design to assess whether the use echoic prompts only or the echoic prompt plus a modeled prompt would result in the intraverbal acquisition in less time.

The remaining three investigators recorded and displayed their data by way of multiple baseline designs: the replication of interventions across subjects, behaviors, or settings (Kennedy, 2005). Employing a nonconcurrent multiple baseline design across participants, Ingvarsson and Hollobaugh (2010), reported the effects of transfer of stimulus control procedures on the acquisition of question answering. Two sets of authors assessed the effects of transfer of stimulus control procedures across behaviors (Goldsmith et al., 2007; Finkel & Williams, 2001). Goldsmith et al. (2007) reported multiple probe data across three categories (e.g., animals, colors, fruits) for each participant with a fourth category serving as a constant series control. Finkel and Williams (2001) chose to employ multiple baseline design across behaviors to examine the effects of textual versus echoic prompts on teaching intraverbal responses.

2.2.2.3. Dependent measures

Since intraverbal repertoires involve a variety of response forms—including, filling in blanks, answering questions, engaging in social interchanges, word associations, and behavior chains—it is important for researchers to know the type of response forms taught and how those responses are measured. All studies reported the effects of transfer of stimulus control procedures on answering questions. The targeted intraverbals ranged from academic intraverbal repertoire and categorical intraverbals to conversational language. Six sets of authors chose to teach the participants academic intraverbals (Humphrey et al. 2013; Valentino et al. 2012; Ingvarsson & Le, 2011; Ingvarsson & Hollobaugh, 2011; Vedore et al. 2009; Ingvarsson et al.,

2012). Vedora et al. (2009) reported the effects of prompts on the accuracy of a participant's one word responses (e.g., answering "cook" when asked "What do you do with a stove?"). Ingvarsson and Hollobaugh (2011), Ingvarsson and Le (2011), and Ingvarsson et al. (2012) measured the number of prompted and unprompted correct answers to the target questions (e.g., "What do you use to tell time?"). Humphrey et al. (2013) and Valentino et al. (2012) recorded counts of correct and incorrect intraverbals and calculated accuracy percentages based on the number questions for each session.

Finkel and Williams (2001) measured the effects of prompting tactics on the correct full-sentence and partial answers across three sets of personal questions (e.g., "What is your name?"). The full-sentence answers were counted as one point (e.g., "My name is John"), while the partial answers were equal to half a point. Goldsmith et al. (2007) reported the effects of picture prompts on the number of correct, non-repeated, independent responses to the category-specific questions (e.g., "What are some colors?"). Emmick et al. (2010) compared the cumulative number of correct answers for conversational questions taught in two treatments: transfer of stimulus control with fluency building instruction and transfer of stimulus control without a fluency component. Unlike the aforementioned studies, Ingvarsson and Hollobaugh (2010) chose to teach the participants a variety of intraverbals, including personal information (e.g., Where do you live?), general knowledge (e.g., Where do you buy groceries?), and academic intraverbals (e.g., How much is a dime?). The authors used event recording, in which they counted the number of times the correct response occurs. Specifically, when given a single question, the experimenter collected data on whether the participants gave the correct response or they said "IDKPTM".

2.2.2.4. Efficacy of transfer of stimulus control procedures

One of the purposes of this literature review is to determine to what extent transfer of stimulus control procedures influences the improvement of intraverbals in children with ASD. All researchers documented that the use of these procedures were successful to evoke a variety of intraverbals.

Six studies targeting academic intraverbals reported positive outcomes as a result of implementing transfer of stimulus control procedures (Humphrey et al. 2013; Valentino et al. 2012; Ingvarsson & Le, 2011; Ingvarsson & Hollobaugh, 2011; Vedore et al. 2009; Ingvarsson et al., 2012). Humphrey et al. (2013) employed an adapted alternating treatments design embedded in a concurrent multiple-probe design to evaluate the effects of least to most prompting with repeated discriminative stimulus on the acquisition of intraverbals. The data from this study revealed that all participants increased the percentage of correct responses following the intervention across all six sets of intraverbals, consisting of 18 questions. According to baseline data, the participants were not able to answer any questions correctly, thus they had 0% correct responses. After the introduction of least to most prompting either with repeated discriminative stimulus or without repeating discriminative stimulus (i.e., presenting stimulus discrimination once) the participants were using between 80%-100% correct intraverbals across six different intraverbal sets. In addition, the results of Humphrey et al. (2013) showed that repeating the discriminative stimulus showed no difference on the rate of skill acquisition compared to presenting the discriminative stimulus once. Utilizing a modified alternating treatments design with a repeated A-B design across two sets of academic intraverbals, Valentino et al. (2012) reported that the use of modeled prompts in addition to echoic prompts produced faster acquisition compared to the use of echoic prompts only. During baseline, an adolescent

diagnosed with ASD did not respond to the six target intraverbals except for one question: “What do you throw?” The introduction of the condition of echoic prompts only resulted in variable and slightly increased responses ($M=52.3%$); however, the use of echoic prompts with modeled prompts indicated an immediate increase and stability in intraverbal responses ($M=80%$). In the study of Vedora et al. (2009), two children with ASD were successfully taught the target intraverbal repertoires by using textual and echoic prompts. The authors used three sets of questions for each participant. Each set consisted of two questions; one question was taught using a textual prompt and the other was taught using an echoic prompt. With the implementation of textual and echoic prompt conditions, the number of correct answers increased from zero to six for the participants. The participants in the Ingvarsson and Hollobaugh (2011) study gave no correct response to either set of five questions. All participants met the criterion of four out of five correct intraverbal responses on three consecutive sessions in both picture and echoic prompt conditions. Although the participants in the study of Ingvarsson et al. (2012) could answer questions about state birds (e.g. “What is the state bird of Idaho”) following either the picture prompt condition or the verbal prompt condition, all participants met the mastery criterion more rapidly in the picture prompt condition compared to the verbal prompt condition. (The number of trials required to meet mastery criterion in the picture prompt condition versus the verbal prompt condition: participant 1, 72 trials versus 132 trials to reach criterion; for participant 2, 120 trials versus 144 trials to criterion; 84 trials versus 108 trials for participant 3; and 72 trials versus 168 trials to criterion for participant 4). Additionally, Ingvarsson and Le (2011) reported that the use of vocal, picture, and textual prompts were effective in establishing intraverbal responses in four boys with ASD. While Ingvarsson and Le (2011) administered 10 questions for vocal and picture prompt conditions with three participants,

15 questions were taught using textual, picture, and vocal prompts for one participant. Training probe data showed that all participants answered the assigned questions correctly in all the prompting procedures.

For teaching categorical intraverbals, Goldsmith et al. (2007) reported that the use of picture prompts was effective in teaching intraverbals. The authors employed a multiple baseline design across four categories to assess the effects of picture prompts on question answering. The results showed that all participants acquired the target intraverbals with varying performance across categories. Goldsmith et al. (2007) stated that picture prompts required more trials to reach the mastery criterion for the first category for all participants (using picture prompts took 100 trials to reach criterion for participant 1, 84 trials to criterion for participant 2, 109 trials to criterion for participant 3), but the acquisition of the intraverbal responses occurred faster for subsequently trained categories.

Targeting personal information questions, the results from the study of Finkel and Williams (2001) showed that both textual and echoic prompts were effective in teaching a child with ASD to respond appropriately to social questions. The child who could not respond to any of the 12 questions prior to the study increased the number of full-sentence and partial-sentence responses to the questions taught with textual and echoic prompts. Finkel and Williams (2001) provided three sets of questions, each consisting of two questions for the textual prompt condition and two questions for the echoic prompt condition. The participant was capable of giving partial answers to almost all six questions taught using echoic prompts; however, he produced full-sentence answers to the four or five questions taught with textual prompt. Although improvements occurred in the number of partial-sentence answers following the use of

echoic prompts, the echoic prompt condition was not as effective in teaching full-sentence responses as compared to the condition of textual prompt.

Unlike the aforementioned studies, Emmick et al. (2010) aimed to teach three sets of conversational intraverbals to three children with ASD (e.g., Answering “I like to play games on the computer,” when someone asked “what do you like to do for fun?”). Emmick et al. (2010) conducted an alternating treatments design to evaluate the effectiveness of textual prompting (i.e., textual cue) and reading fluency in the acquisition of intraverbals. The results indicated that two participants met the mastery criterion—giving a full sentence respond correctly for five consecutive days—more quickly with transfer of stimulus control procedures plus fluency building instruction, than transfer of stimulus control condition only. For instance, one participant reached the mastery criterion for one set of intraverbals using textual prompting and reading fluency instruction while only textual prompting required more trials to met mastery criterion. However, data from one participant revealed inconsistent results. One set of intraverbals was acquired more rapidly in the fluency and transfer of stimulus control condition while another set of intraverbals was acquired more quickly in the transfer of stimulus control without fluency condition.

Ingvarsson and Hollobaugh (2010) taught four participants with ASD to say “I do not know please tell me” (IDKPTM) to the unknown questions using verbal prompt and constant time delay. The study reported that two out of four participants acquired the correct answers to most of the previously unknown questions following the IDKPTM instruction. Before the IDKPTM training, the participants could neither give IDKPTM response to the unknown questions nor answer the unknown questions correctly. The introduction of IDKPTM training resulted in the acquisition of IDKPTM response and the correct answers to five unknown

questions. Once the participants began to give correct responses, a decrease in IDKPTM response occurred. The remaining two participants reached the target level of at least 80% correct intraverbal responses across two consecutive days after receiving additional interventions, providing tangible reinforcement for one participant and the use of verbal prompts for correct responses for the final participant.

2.2.2.5. Maintenance and generalization

Of the 10 studies reviewed, eight sets of authors examined to what extent intraverbals were maintained and generalized (Humphreys et al., 2013; Finkel & Williams, 2001; Goldsmith et al., 2007; Ingvarsson & Hollobaugh, 2011; Vedora et al., 2009; Ingvarsson & Hollobaugh, 2010; Ingvarsson & Le, 2011; Emmick et al., 2010). There was a wide range of follow-up data across studies: Humphreys et al. (2013) conducted a one-month follow-up assessment and found that participants maintained intraverbals varying between 33%-66% correct. Finkel and Williams (2001) collected data at one and two weeks post-intervention and found better maintenance scores in the textual prompt condition (5 out of 6 questions answered correctly) than in the echoic prompt condition (3 out of 6 questions answered correctly). In the study of Ingvarsson and Le (2011), the interval between the completion of the intervention and the follow-up data varied, ranging from five to 18 weeks. Maintenance data across three different treatment conditions—textual prompt, picture prompt, and vocal prompt—revealed that all participants maintained newly acquired intraverbals in all treatment conditions (except one participant whose performance was variable: performing between 1 and 4 out of 5 correct intraverbals across all treatments). Emmick et al. (2010) conducted either a one-week or two-week follow-up probe for two treatment conditions: textual prompting with reading fluency instruction and textual prompting condition only. While two participants maintained some intraverbal responses for

both fluency and non-fluency treatment conditions, one participant maintained all intraverbals regardless of the treatment conditions. Inconsistent with other findings, Goldsmith et al. (2007) conducted the initial follow-up trials following the completion of intervention and a 2-month follow-up assessment, finding poor maintenance performance for all participants.

Generalization, or the extent that the skills obtained can be displayed across people, settings, or activities (Alberto, & Troutman, 2009), was measured in only six studies (Goldsmith et al., 2007; Ingvarsson & Le, 2011; Ingvarsson & Hollobaugh, 2011; Vedora et al., 2009; Emmick et al., 2010; Ingvarsson & Hollobaugh, 2010). Goldsmith et al. (2007) taught the participants categorical intraverbals using transfer of stimulus control procedures and measured generalization across the untrained category (e.g., “What are some pieces of furniture?”). None of the participants were able to transfer the skills to novel intraverbal responses. In the Ingvarsson and Le (2011) study, a person who was not involved in training sessions measured generalization of the intraverbal responses prior to and after the prompt comparison phases. All participants showed generalization of intraverbal responses to the novel person in each generalization posttest (Picture prompting, textual prompting, and vocal prompting). Similarly, Ingvarsson and Hollobaugh (2011) and Vedora et al. (2007) conducted generalization probes with each question set and found that all participants generalized newly acquired intraverbal responses across people. Ingvarsson and Hollobaugh (2010) measured generalization of the IDKPTM response with untrained unknown questions across people and settings, finding the generalization of the IDKPTM response for all participants (except one who showed no generalization of the response in either the training room with different people or in classroom generalization probes). In contrast, in their study, Emmick et al. (2010) implemented generalization probes to examine to what extent intraverbal responses were generalized across

people and responses. The results of the generalization probes indicated that neither textual prompting nor textual prompting with fluency instruction produced clear and consistent benefits in skill generalization across people and responses.

2.2.3. Discussion

The purpose of this review was to examine the existing body of research regarding transfer of stimulus control procedures and its effects on teaching intraverbals to children with ASD. Results were consistent across 10 studies that the transfer of stimulus control and fading procedures appeared to be effective in teaching intraverbals. The most commonly used prompting strategies were picture, verbal, and textual prompts, along with time delay and response fading procedures. The majority of investigators focused on teaching academic intraverbals while a few of them targeted either conversational or categorical intraverbals. Although all studies reported positive outcomes, generalization and maintenance of intraverbals were limited.

Three important conclusions can be drawn from this review. First, not only children with language delays, but also children with ASD who have various verbal abilities can learn to answer questions as a result of implementation of transfer of stimulus control procedures. All 27 participants who were taught intraverbals using response prompts and fading procedures acquired the target intraverbals. The use of these procedures was successful to evoke a variety of intraverbals. While a substantial amount of research has shown that prompting and prompt fading procedures are widely used for teaching a variety of skills to children with autism (National Autism Report, 2009; National Research Council, 2001) Charlop-Christy and Kelso

(2003) also reported that these procedures were effective and efficient in teaching question answering in three children with ASD.

Second, this literature review shows that transfer of stimulus control procedures appeared to be effective in teaching both simple intraverbal relations (e.g., “What says woof woof?”) and complex intraverbal relations (e.g., “What do apples grow on?”). However, the majority of researchers have taught intraverbals containing “what” questions with simple discriminations (e.g., “What is your name?” (Finkel, & Williams, 2001); “What animal says ‘oink’?” (Ingvarsson, & Hollobaugh, 2011). A few of the investigators targeted intraverbals involving complex verbal stimuli (Ingvarsson & Le, 2011; Ingvarsson & Hollobaugh, 2011; Ingvarsson et al., 2012). Although learning simple intraverbals will probably facilitate learning conditional discriminations in the intraverbal behavior (Axe, 2008; Sundberg, & Sundberg, 2011), further research is needed to understand whether transfer of stimulus control procedures can be effective in teaching complex intraverbals containing adjectives and prepositions.

Third, although all participants produced increased unprompted intraverbals following the intervention, it is important to consider the fact that five out of 10 studies reported multi-component interventions that made it difficult to determine what components of transfer of stimulus control procedures provided successful transfer from the prompt to the target stimulus: Goldsmith et al. (2007) added differential reinforcement and schedule thinning to increase the likelihood of correct independent responses. Similarly, Humprehys et al. (2013) and Finkel et al. (2001) implemented differential reinforcement in addition to transfer of stimulus control procedures. Valentino et al. (2012) interspersed previously mastered tasks with the target intraverbals to decrease prompt dependence and increase independent responses. Ingvarsson and Hollobaugh (2010) used additional reinforcement (e.g., edible items) to strengthen unprompted

intraverbals. Future researchers may conduct component analysis to understand which components are necessary for the transfer of stimulus control procedures to be effective.

Another research question was which prompting strategies and prompt fading procedures were effective in teaching intraverbals. The prompting and prompt fading procedures outlined for teaching intraverbals produced independent responses in all participants; however, the findings showed that none of these strategies were generally effective for establishing intraverbal responding across learners of varying language abilities. Five sets of authors examined direct comparisons of the effectiveness of various prompting tactics, and the current search yielded inconsistent results across individuals with ASD. Some researchers reported the rapid acquisition of intraverbals by the use of textual prompts (e.g., Finkel & Williams, 2001) while others found that vocal prompts resulted in fewer training sessions compared to textual prompts (e.g., Ingvarsson & Le, 2011).

The reason mixed results were obtained regarding the most effective transfer method may be related to individual participant's existing repertoires and history with the use of prompts (Coon & Miguel, 2012; Ingvarsson & Le, 2011; Finkel & Williams, 2001). Cihon and Miguel (2012) investigated whether reinforcement history with a particular prompt type would produce concomitant increases in the acquisition of intraverbals among four typically-developing preschool-aged children. The authors compared acquisition rates when intraverbals were taught using either echoic or tact prompts following exposure training with one prompt type. The results showed that the acquisition of the intraverbal responses occurred faster with the prompt method most recently used rather than the prompt method that had not been recently used. For instance, it may be the case that if a skill was recently taught via a picture prompt, then transferring control from the picture prompts to the verbal stimuli may be more efficient than the use of vocal

prompts for teaching intraverbals. Some research has also supported the influence of individuals' history with different prompting methods on the acquisition of intraverbals in children with ASD. Finkel and Williams (2001) reported that their participants had a history of failures with echoic prompts that facilitated the greater levels of attention to textual prompts. Since there is lack of evidence about the impact of history with the use of prompts, additional studies would strengthen conclusions regarding the effects of reinforcement history with a particular prompt type.

Another important research question was related to understanding the effects of transfer of stimulus control procedures on the maintenance and generalization of intraverbals. The current literature review yielded mixed results. While some researchers reported that children maintained the gains demonstrated during the experimental phase of the intervention, some researchers documented that there were very few sustained intraverbals when the procedures were removed. One possible explanation for lack of sustained intraverbals is that tangible reinforcers used for establishing stimulus control may hinder the use of intraverbal responding in a setting where the behavior will be used (Cihon, 2007). In the literature, the majority of participants' responses were maintained only by tangible reinforcers, rather than by naturally occurring reinforcement contingencies (e.g., social praise). Therefore, whether the participants could maintain the acquired responding by the naturally-occurring reinforcement remains unclear.

All participants were capable of using intraverbals under the controlled training conditions, but there was limited generalization of responses across settings, people, and responses. The lack of generalization is not surprising because no generalization strategies were included in the current literature review (Stokes, & Baer, 1977). That is, the researchers took a

“train and hope” approach to generalization in that the intervention was implemented to teach intraverbals and then tested to see if generalization occurred. Further researchers may include methods to promote generalized behavior change.

2.2.3.1. Limitations of existing research

The research noted above provides promising outcomes related to the use of transfer of stimulus control procedures for teaching intraverbals. However, some methodological design issues need to be considered when interpreting the results of this literature review.

One area of consideration in previous intraverbal research is the lack of experimental control. Experimental control is a critical component to determine if changes in behavior are a result of the intervention, other than extraneous factors (Johnston & Pennypacker, 2008). Four out of 10 studies failed to rule out some alternative explanations for the study outcomes precluding experimental control and an established functional relation (Ingvarsson, & Le, 2011; Vedora et al., 2009; Emmick et al., 2010; Ingvarsson et al. 2012). Ingvarsson and Le (2011) and Vedora et al. (2009) reported that the question of complexity and difficulty was not equal across question sets (Vedora et al., 2009; Ingvarsson & Le, 2011). Kennedy (2005) states that if there is no equivalence among the tasks, the differences in conditions may be a result of differences in the difficulty of questions and responses, rather than effectiveness of instructional procedures. Therefore, transfer of stimulus control procedures may not be responsible for the increased intraverbal responses in the studies of of Vedora et al. (2009) and Ingvarsson and Le (2011). Furthermore, Emmick et al. (2010) selected the target intraverbal responses for each participant based on the reports provided by teachers, parents, and direct-care staff. Questions were chosen arbitrarily—without assessing the prerequisite skills of the participants—may influence the results of the study. Because none of the participants’ existing intraverbal skills were assessed,

the effects of the intervention on the acquisition of intraverbals is questionable. In addition, Ingvarsson et al. (2012) indicated that the picture prompt condition resulted in faster acquisition of intraverbals compared to the condition of the verbal prompt, but the failure to equate the number of prompts for each prompt condition may have influenced the results. Since there was inequality in the number prompts the participants were given, it is highly likely that the use of picture prompts was not the only reasonable explanation for any difference in intraverbal responding.

Another area of consideration is lack of treatment fidelity data across the research studies. Treatment fidelity refers to the degree to which interventions are implemented accurately (Snell & Brown, 2011; Gresham, Gansle, & Noel, 1993). Treatment fidelity is necessary—but not sufficient—for attributing changes in performance to the intervention (Gresham, Gansle, & Noel, 1993). Failure to consider accuracy and consistency of implementation of the intervention poses threats to internal (i.e., research results mean what they appear to) and external validity (i.e., generalization of the results to other populations). These threats make it difficult to draw conclusions about the effectiveness of the intervention or to replicate a study with the desire of gaining the same results (Gresham, Gansle, & Noel, 1993). In the literature, only four out of 10 studies reported fidelity treatment data, showing high level of implementation fidelity (Goldsmith et al. 2007; Ingvarsson et al. 2012; Emmick et al., 2010; Humphreys et al. 2013). However, the remaining six studies failed to document information about the consistency and accuracy of intervention implementation. Although these six studies reported positive outcomes as a result of the implementation of transfer of stimulus control procedures, conclusions drawn from these studies are questionable because there is no data concerning the implementation of

the intervention. In other words, it is less likely to attribute changes in intraverbal responding to the transfer of stimulus control procedures.

Another important consideration is lack of social validity data. Social validity refers to the evaluation of acceptability and appropriateness of behavior goals, procedures, and outcomes (Wolf, 1978). Baer, Wof, and Risley (1987) pointed out “social validity is not sufficient for effectiveness but is necessary to effectiveness” (p.323). An intervention that leads to positive outcomes for students needs to be socially valid to be considered as effective. Although all studies reported that the intervention was sufficient to increase intraverbal responses in the participants, none of the researchers collected social validity data. The ultimate goal of applied behavior analysis research is not merely changing behavior—rather it targets behavior change that improves the student’ quality of life. Thus, further researchers need to evaluate the social validity of instructions focusing on teaching intraverbals (Wolery, Ault & Doyle, 1998).

2.2.3.2. Future directions

Although there is a need for more studies to evaluate the relative efficacy of prompting methods and prompt fading procedures for teaching intraverbals to individuals with ASD, several conclusions can be drawn about the effects of transfer of stimulus control procedures on the acquisition of intraverbals. First, although these procedures lead to acquisition of intraverbals, lack of generalization and maintenance of skills are reported in the literature. For this reason, additional research is needed to understand what producers are necessary for achieving generalized and maintained intraverbal responses in children with ASD. Second, transfer of stimulus control procedures are often used to teach children to use simple intraverbals rather than complex intraverbals. Thus, future researchers may examine if this procedures are effective in teaching complex intraverbals containing prepositions and adjectives. Third,

previous intraverbal research has showed that the majority of researchers have attempted to teach academic intraverbals with little attention to conversational intraverbals. Since children with ASD display delays in initiating and sustaining conversation with others, it is important to understand the effects of transfer of stimulus control procedures on developing conversational skills.

2.2.3.3. Proposed study

Despite improvements in the acquisition of intraverbal behaviors when using transfer of stimulus control procedures, limited generalization and maintenance were observed in the literature. For this reason, future studies should consider the addition of peer-mediated interventions, such as peer-promoters, to the transfer of stimulus control procedures to promote generalization of intraverbals in inclusive settings. Thus, the purpose of this study is to evaluate the effects of transfer of stimulus control procedures (i.e., verbal prompts and a constant time delay) and the peer-prompter procedure on the acquisition and generalization of intraverbals in inclusive settings. Therefore, the research question for this study is: What effect do the use of transfer of stimulus control procedures (i.e., verbal prompts and a constant time delay) and peer initiation training have on the acquisition and generalization of intraverbal responses across peers without disabilities?

3.0 METHODS

3.1 PARTICIPANTS

To recruit research participants, the researcher contacted the principal and the special education director of a public school district located in Allegheny County, Pennsylvania. The purpose and procedures of the study as well as the eligibility criteria for participation were explained. The principal shared the study information with two special education teachers and two general education teachers who worked with students with ASD. Once IRB approval was obtained, the researcher met with these teachers to identify possible participants. Special education teachers sent informed consent forms to the four parents of children with ASD. Although three parents of children with ASD were interested in having their child participate in this study, only two were found eligible for the study. To recruit typically-developing peers, two general education teachers identified a total of eight possible typically-developing participants and the researcher obtained consent and assent for the four typically developing peers.

The researcher recruited two students with ASD who attended a public school and were assigned to a general education classroom 78% of the school day (See Table 1). Both participants were ages 7-8 and had a documented diagnosis of ASD that included marked deficits in social skills. The participants were vocal responders who used spontaneous speech to make requests, responded to other's speech, and gave intraverbal responses to some social questions, while

having a limited intraverbal repertoire. An assessment of Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP, Sundberg, 2008) was administered to each participant to determine their tact, listener responding, and intraverbal repertoires.

Jack was a 7-year-old male who qualified for special education supports and services as a student with ASD, speech or language impairment and other health impairment. He was able to produce sentences of four words, name a variety of items and use possessive's. His academic skills were significantly below those expected for a child his age. At the time of the study, his pull out special education services included 30 min reading and 30 min math enrichment every day, and three 20 min speech therapy sessions every week. Areas of concern with behavior included engagement in verbal aggression (e.g., screaming, yelling) and physical aggression (e.g., hitting). He refused to comply with directives and struggled to follow classroom rules. During classroom observations, he was observed to demonstrate no conversation initiation to his peers. A few responses to peer's initiations were observed, but he did not sustain the interactions.

Jack scored in the Level 2 (18-30 months) on the VB-MAPP, with beginning skills on Level 3 tact, mand, and listener responding skills. His verbal repertoire was comprised of three to four word mands, at least 200 tacts, and a listener responding repertoire of at least 200 response selection. He answered some "what", "where", and "who" correctly and was not able to respond to other's speech in a conversational way.

Darrel was an 8-year-old male and was a 2nd grade student. He was diagnosed with ASD and speech or language impairment and other health impairment. Based on his special education teacher's reports, he demonstrated reading, math, and writing skills below those of typical children his age. To address academic delays, his pull out special education consisted of 30 min reading and 30 min math every day. In addition, he had a mild expressive and receptive

communication impairment. He received two 20 min a week speech therapy sessions to improve his language abilities. During classroom observations, his communication with peers was argumentative or centered on perseverative interests such as specific television shows (e.g., Power Rangers and Ninja Turtles).

Darrel scored in the Level 3 (30-48 months) on the VB-MAPP. His verbal repertoire consisted of six to seven word intraverbals, tacts, mands, and listener responding skills. Although he was able to answer “what”, “where” and “who” questions he had difficulty responding to others’ speech, unless asked direct questions.

Table 1 : Participants

<i>Participants</i>	<i>Age</i>	<i>Grade Level</i>	<i>Gender</i>	<i>Ethnicity</i>	<i>Classification</i>
Darrel	8	2 nd	Male	African-American	Autism
Jack	6	1 st	Male	African-American	Autism

3.1.1. Conversation Partners.

A total of four peers without disabilities (two for each participant with ASD: one trained peer and one novel peer for generalization probes) were selected to participate in this study. These peer participants attended the same school as the participants with ASD. The general education teachers of the participants with ASD supported the experimenter in student

recruitment based nominations of students 1) demonstrating social skills (e.g. the ability to initiate and maintain conversation), 2) displaying communication skills (e.g. using both verbal and nonverbal language effectively), and 3) attending to instruction for a specified period of time (e.g. 5 to 10 minutes). The researcher paired each participant with ASD with two peers who were the same age as the participant.

Jack was paired with William and Maggie. William was a 6-years-old male student and was selected to serve as a conversation partner during baseline and intervention sessions. Maggie was a 6-year-old female student who participated in the generalization phase of the study. However, William and Maggie were not classmates of Jack and had limited interaction with him outside of the study. Darrel was paired with Caleb and Tamitra. Caleb was an 8-year-old male student and was taught to support conversation skills of Darrel in the baseline and intervention phases of the study. Tamitra was an 8-year-old female student and was present during generalization probes. Both peer participants were classmates of Darrel. Table 2 contains conversation partners' details.

Table 2: Conversation Partners

<i>Conversation Partners</i>	<i>Age</i>	<i>Grade Level</i>	<i>Gender</i>	<i>Ethnicity</i>	<i>Classification</i>
William	6	1 st	Male	White	None
Maggie	6	1 st	Female	African-American	None
Caleb	8	2 nd	Male	African-American	None
Tamitra	8	2 nd	Female	African-American	None

3.2 SETTING

The interventions took place for both participants within a separate room in their school, which was rearranged for the purpose of this study. The room was located directly behind the participants' classrooms. All baseline, intervention and generalization sessions were implemented in the same area. The room included three chairs, two rectangular tables, and several shelves with a variety of books and teaching materials placed in containers. During the transfer of stimulus control procedures, the participants were taught to give correct intraverbals while they sat with the researcher at a table. Sessions for practicing intraverbals with the peers were implemented in the same separated room where a peer, the participant, and the experimenter sat at a table. No other children or teachers were present in the room. Sessions were conducted at least three days per week.

3.3 MATERIALS

The materials needed for the study included three conversation scripts for each participant, one digital video recorder, tripod, toys and edible items based on the interests of the participants of ASD and the neurotypical peers.

Following VB-MAPP assessment, multiple-stimulus preference assessment without replacement (MSWR), and teacher interviews, a list of conversation topics was selected for each participant. Based on the participants' preferred topics, the experimenter created conversation scripts; each consisted of 10 single-line conversation initiation statements and 10 responses to these statements (See Appendix A, Example Conversation Script). The conversation topics Jack

and his peers (William and Maggie) preferred to talk about were superheroes, dogs, and dinosaurs. The conversation topics Darrel and his peers (Caleb and Tamitra) preferred to talk about were dinosaurs and dogs. For the purpose of identifying the third conversation topic, the experimenter tested the remaining preferred topics of Darrel, including cats and superheroes. However, he successfully engaged in conversation with the experimenter about these topics. Based on his special education teacher's report, Darrel had difficulty responding to his peers or the adults when they shared their feelings with him. The experimenter then created a conversation script in which a peer shared how he felt when he was sick and what he did to feel better, in order for Darrel to hear an example of how one might maintain casual conversation. In addition, the experimenter interviewed the participants' teachers to ensure social validity of the conversation scripts targeted in this study. Based on teachers' reports, the target conversation scripts selected for each participant were age-appropriate for the participants to improve their social communication skills.

The selected conversation statements and their responses were printed on individually laminated pieces of paper (5cm by 5cm). Other materials included a copy of a procedural fidelity checklist for transfer of stimulus control procedures and a copy of a procedural fidelity checklist for peer initiation treatment. In addition, highly preferred objects, tangible items, and activities were identified using multiple-stimulus presentation preference assessment without replacement (DeLeon & Iwata, 1996).

3.4. EXPERIMENTAL DESIGN

A multiple baseline across behaviors design was used to assess the number of independent intraverbal responses. The design included: baseline, tier 1 (i.e., the first conversational script), tier 2 (i.e., the second conversational script), and tier 3 (i.e., the third conversational script), with generalization probes at the end of training for each tier, and maintenance for all three tiers. The experimenter measured maintenance of all behaviors for four sessions three weeks after the intervention ends.

In this design, transfer of stimulus control procedures and peer initiation training were applied across three conversational scripts to the same individual in the same setting with peers without disabilities (Gast, Skouge, & Tawney, 1984). Following the baseline phase, the intervention was individually and systematically applied to one conversational script one at a time, while the experimenter continued to implement baseline testing to untreated conversational intraverbals. Once the participant met the criteria for the first behavior—answering questions with 80% accuracy for three consecutive days—the intervention was applied to the second conversation script. At the end of the training for the first behavior, generalization data were collected with novel peers without disabilities. The experimenter systematically and sequentially applied the intervention to the remaining behaviors and conducted generalization probes for the target behaviors until all tiers were completed (Gast, Skouge, & Tawney, 1984).

3.5. DEPENDENT VARIABLE

3.5.1 Number of correct intraverbal responses.

All sessions were video recorded. The dependent variable was the number of contextually appropriate independent intraverbals in response to conversational questions and statements. Contextually-appropriate intraverbal behavior refers to a verbal response that is relevant to the statement said by a peer and includes a grammatically correct sentence in response to questions or statements (Daubert, Hornstein, & Tincani, 2015). An example of a contextually appropriate intraverbal response can would be saying “I like dogs, too” after hearing “I like dogs” from a peer. Contextually inappropriate intraverbal behavior is a vocal verbal response that is irrelevant, repetitive, echolalic, and unclear and it is emitted more than 5s following the verbal discriminative stimulus. In addition, partial responses that include some of the critical words were considered to be incorrect. An example of a contextually inappropriate intraverbal response would be saying “I am not sick” upon hearing “What happens when you get sick.” In situations where the peer or the child asked a question or made a statement out of the given conversation scripts, the experimenter did not intervene, but she made sure that all target questions were asked in a session.

3.5.2 Rate of adult-delivered prompts during peer-initiation condition

During peer initiation sessions, the researcher collected data on the number of adult delivered prompts per minute. Adult delivered prompts were defined as modeling the correct response verbally (i.e., verbal prompt). To measure this dependent variable, all video clips of

peer-initiation sessions were reviewed at a later time. The number of teacher prompts required across each conversation script was calculated to determine if prompting decreased following the use of transfer of stimulus control procedures and peer-initiation.

3.6. INDEPENDENT VARIABLE

The independent variables included the use of verbal prompts, a constant time delay procedure, a peer prompter, a behavior specific praise and tangible reinforcers. Prior to intervention, the peers were taught to read the identified conversational statements using modeling, prompting, and role-playing. The intervention began each day by applying verbal prompts and a prompt fading procedure to teach the participants the target intraverbals. After this teaching procedure, the researcher employed a peer-prompting procedure in which the peer presented the initial conversation statement from the predetermined conversation script to the participant and the participant responded to the peer and maintained the conversation. During peer-prompted sessions, the researcher also used a 4second constant time delay procedure to evoke correct responses for both participants and peer-prompters. If the participants or peers gave an incorrect response or no response, they were taught the correct response using verbal prompts. The procedures were implemented at least three days a week and lasted approximately 15-20 minutes.

3.7. PROCEDURE

3.7.1 Preference assessment

A multiple stimulus preference assessment without replacement (MSWO; DeLeon & Iwata, 1996) was administered to identify items and activities that could function as reinforcer for each participant with ASD as well as each conversation partner. Prior to employing MSWO, the experimenter interviewed the participants' teachers and observed each participant three days a week in the child's classroom to identify potential reinforcers. Following the teacher interview and class observation, the experimenter made a list of the top activities and items the participants preferred to consume or play. For typically developing peers, information gathered by the conversation partners and their teachers guided the selection of items to be included in the MSWO.

At the beginning of each session, the experimenter sat across a table from the participant and presented items in a linear array approximately 2 feet from the student. The experimenter then prompted the participant to pick one of the stimuli. After the participant selected one item, he was allowed to access to the item for 30 seconds. While the participant was playing with that item, the experimenter blocked him accessing additional items during that trial. Prior to the next trial, the selected item was removed from the array and the sequence of remaining items was rotated. The researcher ended the first session if all items were selected or if the participant did not pick any of the remaining items within 30 seconds. Three sessions were conducted in this manner across three days. Appendix F contains the fidelity of checklist for the MSWO preference assessment.

Items and activities selected were used as reinforcer throughout sessions, and they were paired with the delivery of social praise. In addition, the preference assessment guided the researcher to pair children with ASD and their peers without disabilities based on their unique interests and preferences.

3.7.2. Intraverbal assessment

The VB-MAPP scores used for participant selection guided the researcher to determine how the content would be presented to the participants. To identify a topic of conversation for each participant, a preference assessment was conducted. After the topics of conversation had been selected, each participant received an intraverbal pre-test to determine if they could respond any conversation statements developed by the researcher. Each conversation script consisted of 10 conversation initiation statements and 10 responses to these initiation statements (e.g., When peer says “I will teach my dog to sit down”, the participant’s response is: “I will teach my dog to lay down.”).The experimenter tested each conversation script three times over the course of five days. While correct intraverbal responses resulted in praise, incorrect answers were ignored. The questions or conversation statements that were answered incorrectly on all assessment trials were considered unknown for that participant. Once the target intraverbals to teach were identified, the experimenter began to collect baseline data for three conversation topics for each participant.

3.7.3. Baseline

During baseline, the child and peer were seated in chairs next to each other. The instructor sat across the participants and placed a video recorder device across the table, out of the reach of the

participant and the peer. The selected peer held a paper showing a set of ten conversation statements and read the first conversation statement to the participant from the given paper. The peer gave a five-second time delay to allow the participant to respond to conversation. The experimenter recorded the response as correct if a grammatically correct sentence to the question or statement occurred. If the participants gave an incorrect response to a question or gave no response, the incorrect response was recorded and the next conversation statement was presented. To encourage the child to maintain conversation, the peer gave a normal social acknowledgment (e.g., “yeah”, “really”, “oh, great”). If any conversations were completed successfully, both the participant and the peer received a descriptive praise by the experimenter (e.g., thanks for doing great work today). Baseline conditions lasted until the experimenter obtained a stable pattern of responding for the participants. Stable responding occurred once a participant’s correct intraverbals per session demonstrated relatively low variation over a period of time (minimum of five days, Johnston & Pennybacker, 2009).

3.7.4. Peer-initiation training

Procedural integrity containing the components of peer-initiation training was developed (See Appendix C and D). After conversation peers had been selected, direct training on how to initiate and maintain conversation with the participants with ASD occurred. Training sessions consisted of two sections: a) training on awareness of disabilities, in which the experimenter gave a brief description of ASD and the difficulties children with ASD experience during social interaction, and b) training on how to use conversation scripts in which conversation partners learned to initiate the conversational statements from the predetermined conversation (e.g., “Do you like to watch videos?”), learned to give the participant time to respond (e.g., waiting 5s before

presenting the next script), and learned to respond to his/her peer (e.g., I also like to watch SpongeBob videos). Modeling, prompting, and role-playing techniques were applied to conversation partners to increase the social skills of the participants with ASD. Initially, the experimenter modeled by role-playing the use of conversation scripts with the peer acting the part of the participants with ASD. Then peers practiced the scripts by role-playing with the trainer, and they received feedback and reinforcement.

3.7.4.1. Section one

This training section lasted approximately 20-30 minutes and occurred during the school day. Four peers of without disabilities attended training sessions separately. Peer participant were taken out of class by the researcher and brought to the room directly behind their classroom. The researcher discussed the characteristics of ASD and the purpose of a peer initiation procedure with the participant seated in a table using teacher-led discussion and autism videos obtained from the Sesame Street and Autism website (autism.Sesamestreet.org). The researcher asked the peer what he knew about autism and had him watch the videos of children with autism designed for children. For example, the peer participants learned that some children with ASD had difficulty making eye contact and some of them wanted to be alone. They learned that children with autism, like all children, were unique and had different strengths and talents. Then the researcher prompted the peer to ask questions concerning ASD or answered the questions posed by the researcher. The researcher had the participant discuss the ways in which he could be friend with students who were different (e.g., talk about things peer participants might not be interested in). Next, the peer participant listened the purpose of a peer initiation procedure and learned new ways to help include the participants with ASD in a conversational speech (e.g., initiate to conversation with a child with autism). At the end of the first section, the researcher

had the peer discussed the ways in which he/she could engage in conversation with the target participants. All peer participants received a descriptive praise for their active participation.

3.7.4.2. Section two

The researcher introduced the prepared conversational scripts (a total of three conversational scripts for each peer participant). The peer participants were seated at a table with the researcher to listen to the purpose of using conversational scripts. They discussed the appropriate ways to respond to the conversation statements which eventually was going to help them determine whether the answer they received from the participants were acceptable or not. The researcher implemented the following steps: 1) the researcher modeled the target behaviors for the peer participants (e.g., Ask a participant, “What is your favorite football team?”), 2) the researcher did a role-play of a conversation script with the peer participants, 3) the peer participants continued role-playing for all assigned conversational scripts and 4) the peer participants received performance feedback.

Since the peer participants were asked to conduct baseline sessions, the researcher described baseline situations to them. The peers learned the following: a) when the participant gave a correct response, the peer presented the next question, b) the peer gave a 5 second delay to allow the participant to respond, c) the peer asked the next question when no response or an incorrect response occurred.

3.7.5. Transfer of stimulus control procedures

During transfer of stimulus control procedures, the participant sat at a table facing away from his peer to avoid distraction. The instructor positioned herself directly across from the

participant. The instructor made sure that all necessary materials including the cue cards, video recording device, and a cold probe data sheet were present prior to instruction. Each session lasted approximately 5-10 minutes in which the experimenter taught ten conversational intraverbals using verbal prompts. In the transfer of stimulus control procedure, the transfer from verbal stimuli to verbal discriminative stimuli was targeted. In the initial trial, the experimenter gave a verbal discriminative stimulus (e.g., “What sports do you like to play?”) and immediately modeled the correct response (e.g., “Say football”). Next, the experimenter faded verbal prompts using a constant time delay procedure. There was a 4-s delay between the presentation of the verbal discriminative stimuli and the provision of verbal prompts. If participants gave a correct response, the experimenter delivered a descriptive praise statement. If participants failed to emit a correct response the experimenter recorded the response as an incorrect and provided an error correction procedure. In the error correction procedure, the participant was distracted with easy task (e.g., reading a book) and then the experimenter presented the same question along with the use of simultaneous prompting (i.e., providing an immediate prompt after presenting the question). The same procedures were applied to the complete conversation. Once the participant reached the mastery criterion, answering questions with 80% accuracy for three consecutive days, the intervention was terminated.

3.7.6. Peer prompter sessions

After peers were trained, the researcher arranged the environment to have conversation partners practiced the conversation scripts with the participants in the classroom. The peer participant and child were seated in chairs next to each other. The instructor sat between the participants and placed a video recorder device across the table, out of the reach of the

participant and peer. The peer participant held an A4 paper showing 10 target conversation statements and was asked to read the first conversation statement from the paper. In case the peer did not initiate a conversation, the researcher gave subtle verbal instruction (e.g., “read the first conversation line”). If the peer still did not start to the conversation, the researcher applied an explicit instruction to have the peer initiate the conversation (e.g., “Ask your friend what is his favorite movie?”).

Once the peer started a conversation using the conversation scripts, a five second time delay was given to allow the participant time to respond (Charlop-Christy & Kelso, 2003). Correct intraverbal responses resulted in a behavior specific praise by the experimenter. If the participant emitted an incorrect response, the experimenter provided an error-correction procedure. In the error correction procedure, the researcher re-presented the verbal discriminative stimulus along with the use of verbal prompt. Next, without delivering prompt, the same verbal discriminative stimulus was presented to the participant by his typical peer partner. Prompted and unprompted correct responses yielded social reinforcement and the presentation of the next conversational question. This procedure continued until the predetermined conversation was complete. At the end of each session, both the peer and the participant were allowed to consume or play with one preferred item for two minutes.

3.7.7. Data collection for Intraverbal probes

A cold probe (i.e., test) data collection system was administered to assess the acquisition of a set of ten intraverbal responses. The experimenter recorded the cold probe data as “Yes” or “No” in the first 15-20 minutes of a teaching session every day. The Yes/No data were converted into the number of correct and incorrect responses. Once the participant obtained a “Yes” score

on the probe for three consecutive days for all target intraverbals, the participant reached the mastery criterion for the acquisition of intraverbals.

During the cold probe procedure, the peer, and the participant sat at a desk. Similar to the baseline, the peer asked the predetermined questions to the participant and waited for the participant to respond within 5s. The experimenter videotaped cold probe sessions and scored the frequency of correct and incorrect intraverbals the participant emitted. If the participant gave a contextually-appropriate intraverbal response, the experimenter recorded the behavior as “Yes.”. However, responses that contained an incorrect response or an irrelevant answer to the conversation topic were considered as incorrect and be recorded as “No” on a cold probe data sheet. Also, if the participants gave no response following the conversation initiation, the researcher recorded the behavior as incorrect.

3.7.8. Maintenance probes

Once the participants achieved mastery criterion, maintenance probe sessions were conducted in the setting where the training occurred. The number of maintenance data points and time passed between the end of the intervention and the start of the maintenance session varied across conversation scripts for each participant. The researcher collected one maintenance data for Conversation A and Conversation B for Jack. A maintenance probe was administered a month after the intervention for Conversation A and a maintenance data was obtained two weeks after the intervention for Conversation B. In contrast to Jack, the researcher were able to collect three maintenance data per conversation script for Darrel with the exception of Darrel’s third conversation script in that only one maintenance data was obtained. Three maintenance data points were collected a month after the intervention for Conversation A. Similarly, the researcher

obtained three maintenance data for Conversation B but two weeks after the intervention. Because it was the end of the school day, one maintenance data was collected two weeks after the intervention for Conversation C.

During maintenance sessions, the peer implemented maintenance probes to evaluate if participants continued to use intraverbal responses over time. Similar to baseline, the participants' intraverbal responses given in 5s were reinforced. However, no reinforcement was available for incorrect responses.

3.7.9. Generalization probes

The researcher implemented three generalization probes across all tiers to assess if intraverbal responses generalized across novel peers without disabilities. After the participants met mastery criterion, the peers without disabilities presented the target conversation statements to the participants in the training setting. Generalization probes were identical to those used in the baseline condition. Tamitra, a classmate of Darrel, was present for only generalization sessions. For Jack, Maggie engaged in conversation with him during generalization sessions. The experimenter was present in all generalization probes and sat across the table to minimize any impact on interaction. No prompting was provided for the incorrect responses of the participants with ASD; however, the peers received verbal prompts to initiate or maintain the conversation. The reinforcers were available if the participants gave appropriate responses. Incorrect responses yielded no social reinforcement.

3.7.10. Inter-observer agreement

A research assistant was trained to collect data on the number of correct intraverbals from conversations on videos recorded between students with ASD and peers. Once there was 80% agreement on dependent measures on two consecutive video samples, the independent observer recorded data on 30% of the sessions for all phases of the investigation. In addition to inter-observer agreement, intra-observer agreement was assessed by having the independent observer and the experimenter rescore the same video samples. The percentage of intra-and inter-observer agreement was calculated by dividing the total number of agreements by the total number of agreements plus disagreements and multiplying by 100%. For Darrel, mean percentage inter-observer agreement across all phases of the study was 94 % (range=85%-100%). For Jack, mean percentage inter-observer agreement was 95% (range=86%-100%) (See Table 3).

The experimenter and the observer independently checked intra-observer agreement across all phases of the study. Average percentage of intra-observer agreement recorded by the experimenter was 98% for Darrel while Jack's mean percentage of intra-observer agreement was 100%. The second observer also obtained similar level of consensus between first and second behavior recordings. For Darrel, mean percentage of intra-observer agreement was 99% across all phases of the investigation. For Jack, mean percentage of intra-observer agreement was 100%. (See Table 4.).

Table 3: Average Inter-Observer Agreement for Intraverbals

<i>Participants</i>	<i>Mean IOA Agreement for Intraverbals</i>			
	Baseline	Intervention	Generalization	Maintenance
Jack	98.1	90.9	93.3	96.6
Darrel	98.4	91.2	96.6	96.6

Table 4: Average Intra-Observer Agreement

<i>Participants</i>	<i>Mean % Intra-Observer Agreement Recorded by</i>	
	<i>Researcher</i>	<i>Research Assistant</i>
Jack	100	100
Darrel	98	99

3.7.11 Procedural integrity

Prior to intervention, the same independent observer was trained on the procedures for implementing transfer of stimulus control procedures and peer-prompter training. He used two separate fidelity checklists to evaluate whether teaching procedures were being implemented as planned during 30% of the sessions for the two interventions. The experimenter calculated the percentage of procedural integrity by dividing the number of steps implemented correctly by the total number of steps, and multiplying by 100%. For Darrel average percentage of treatment

integrity across two conditions was 95% (range=66%-100%). For Jack average percentage of procedural integrity was 97% (range=75%-100%) (See Table 5.)

Table 5: Average Treatment Integrity Across Two Conditions

<i>Participants</i>	<i>Average Treatment Integrity</i>
Jack	97%
Darrel	95%

3.7.12. Social validity

The researcher administered a social validity questionnaire to teachers of the participants at the conclusion of the study (See Appendix H). Teachers utilized the social validity questionnaire to evaluate their students' performance in the videos. These videotapes were used to evaluate the participants' performance on giving appropriate responses to social questions or conversation statements. To avoid biased evaluations of the treatment, the researcher randomly selected three video clips from the recorded sessions throughout the study. The teachers received randomly selected video clips at the conclusion of the study, but no information was provided regarding recording time of the videos (before, during, or after the intervention). They watched video clips showing their students and peers conversing each other. After viewing the videos, the teachers evaluated how well their children responded to peers' conversation initiations and engaged in conversation using given questionnaire. The teachers filled out the questionnaire for each participant with ASD and each typically-developing peer. The questionnaire consisted of nine

questions with four possible answers. The teachers were also asked to provide general comments about the quality of conversation interactions occurred between children with ASD and their peers.

4.0 RESULTS

4.1 MSWO PREFERENCE ASSESSMENT

The researcher conducted three sessions of MSWO preference assessment across three days with all participants to identify the items most likely be reinforcing. Potential reinforcers for Jack were Legos, a monster truck, a train, Batman, Megazod, Transformer, a dinosaur, and Power Rangers. Jack selected the Legos first seven out of nine sessions, indicating that it was the most preferred one among other potential reinforcers. For his second preferred item, he selected either dinosaur or Batman during eight out of nine sessions. The items included in MSWO for Darrel were transformer, Megazod, a dinosaur, a train, Power Rangers, Batman, a monster truck, a racing car, and Olaf. Darrel selected either Power Rangers or dinosaurs first eight out of nine sessions, indicating that these items could function as highly preferred items. Batman was the second highly preferred item for him.

For the purpose of matching children with ASD with their peers based on their unique interests, MSWO preference assessment was also administered to the typically-developing peers. Potential reinforcers for William were transformer, Megazod, a dinosaur, a train, Power Rangers, Batman, a monster truck, a racing car, and Olaf. William chose a dinosaur or Batman first; indicating that these items were the most preferred ones. Potential reinforcers for Maggie were Barbie, Dora, a dinosaur, Olaf, a monster truck, a train, and a racing car. Results showed that her highly

preferred items were Barbie and Olaf. Potential reinforcers for Caleb were transformer, Megazod, a dinosaur, a train, Power Rangers, Batman, a monster truck, a racing car, and Olaf. He selected either monster truck or dinosaur first, showing that these were his most preferred items. Potential reinforcers for Tamitra were Barbie, Dora, a dinosaur, Olaf, a monster truck, a train, and a racing car. She chose Olaf or racing car first during the sessions, indicating that these were her most preferred items.

4.2 THE NUMBER OF CORRECT INTRAVERBAL RESPONSES

The purpose of this study was to investigate the effects transfer of stimulus control procedures (i.e., verbal prompting and a constant time delay) and peer prompter training on acquisition and generalization of intraverbal responses across peers without disabilities.

Figures 1 and 2 display results for Jack and Darrel. Figure 1 shows Jack's number of correct intraverbal responses for each conversation script during baseline, intervention, generalization, and maintenance sessions. Figure 2 shows the number of correct intraverbals used across conversation scripts for all phases of investigation.

4.2.1 Jack.

4.2.1.1 Conversation A.

During baseline for Conversation A, Jack demonstrated no correct intraverbal responses. Following intervention with Conversation A, he rapidly reached the mastery criterion of 80% correct responding for three consecutive days in eight sessions. Jack showed increases in level

(baseline $M= 0$; IV $M= 6.5$) and an increase in trend (baseline range= 0; IV range= 0-10). When assessing correct intraverbals in the baseline and intervention condition, he demonstrated 92% non-overlapping data points.

Jack participated in three generalization sessions with a novel conversation partner, Maggie. He showed an increase in his level of responding from intervention to the generalization sessions (IV $M= 6.5$; Generalization $M= 8.6$). The percent of non-overlapping data points between the intervention and generalization phases was 90%. The researcher also collected maintenance data a month after the intervention. Although Jack took part in one maintenance check, he maintained the gains demonstrated during the intervention. He performed 9 out of 10 correct intraverbal responses during a maintenance probe for Conversation A. Of the four sessions in the generalization and maintenance conditions, Jack demonstrated 100% non-overlapping data points.

4.2.1.2 Conversation B.

As seen in Figure 1, Jack showed a few or no correct responses during baseline for Conversation B. However, upon intervention with Conversation A, two out of 16 baseline data shows a response generalization effect occurred in Conversation B, with Jack's number of correct intraverbal response increasing from 0 to between 4 to 5 correct intraverbal responses for two nonconsecutive sessions. Prior to intervention, the number of correct responses returned to 0 correct responses. Following the introduction of the intervention, he demonstrated increasing level (baseline $M= 0.6$; IV $M= 5.7$) and increasing trend (baseline range=5; IV range= 8). He met the mastery criterion of 80% correct responding for three consecutive days in 14 sessions. In addition, he displayed 93% non-overlapping data points for correct intraverbals from baseline to intervention.

Once mastery criterion was met, Jack took part in three generalization probe sessions with Maggie before moving into the maintenance phase. Generalization of correct responding across his typical peer was observed. The general level of correct intraverbal responses continued to increase in the generalization phase ($M=9.3$), compared to the intervention levels ($M=5.7$). He demonstrated 100% non-overlapping data points from the intervention to the generalization condition with the frequency of correct intraverbals from three out of three generalization sessions above the frequency of correct intraverbals seen in the intervention phase. Finally, Jack participated in one session in the maintenance phase after two weeks and 9 out of 10 correct responding was maintained during testing without the intervention. He displayed 75% non-overlapping data points from the generalization to the maintenance phase.

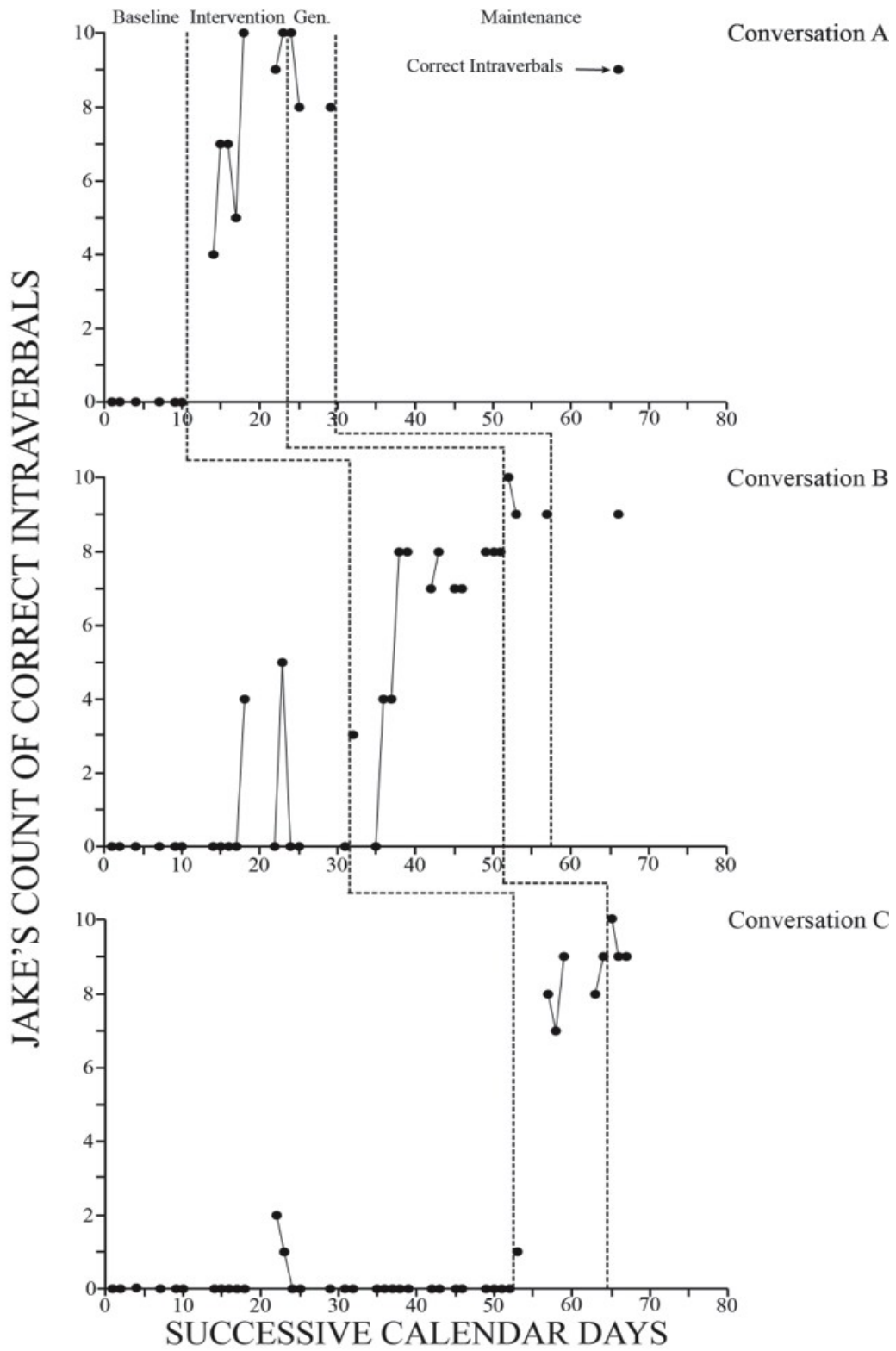
4.2.1.3 Conversation C.

For Conversation C, Jack's initial baseline performance demonstrated no correct intraverbal responses. However, there is a slight response generalization effect observed following intervention on conversation B, with the frequency of responding increasing from 1 to 2 correct intraverbal responses. Prior to intervention, Jack's number of responses returned to 0 correct responses. He reached the mastery criterion of 80% correct responding for three consecutive days directly following the introduction of the intervention. The overall level of responding in the intervention phase ($M=6$) was observably higher than the baseline levels ($M=0.1$). There was also a steady increasing trend throughout the intervention (baseline range=2; IV range=9). When evaluating the percentage of overlap between baseline and intervention, Jack displayed 94% non-overlapping data points.

For generalization sessions, Jack participated in three generalization probes with Maggie. His level of responding in the generalization phase ($M=9.3$) was greater than the intervention phase

($M=6$.), indicating that he did continue correct intraverbal responding even with a novel peer. Of the 10 sessions in the intervention and generalization phases, 80% of the data points were non-overlapping. Following the generalization phase, Jack did not take part in a maintenance check because it was the end of school day.

Figure 1: Number of Correct Intraverbals for Jack



4.2.2 Darrel.

4.2.2.1 Conversation A.

During the first few sessions in baseline for Conversation A, Darrel demonstrated 0 to 1 correct responses to conversation statements. Following the intervention, he immediately met the mastery criterion of 80% correct responding for three consecutive days in six sessions. His level of correct responding in the intervention phase ($M=6.5$) was higher than that observed in the baseline condition ($M=0.1$). An increase in trend occurred in the intervention condition (range=8) compared to the baseline condition (range=1). In addition, there were 90% non-overlapping data points for correct intraverbals from baseline to intervention.

Upon entering the generalization phase, Darrel demonstrated an increasing level of responding with his typical peer, Tamitra. His overall level of correct intraverbal responses in the generalization phase ($M=9$) was higher than the level of correct intraverbal responses in the intervention phase ($M=6.5$). There were also 66% non-overlapping data points through the intervention and generalization sessions. Importantly, Darrel demonstrated desired response generalization during the intervention. He emitted novel intraverbal responses instead of scripted ones. Some quotes made by Darrel seen included “You need a rest” and “You need to take first medicine and then have a soup to feel better.”

A month after intervention, the researcher collected three maintenance data and found that Darrel demonstrated increases in level of responding in the maintenance phase ($M=8$) compared to the intervention condition ($M=6.5$), even with the withdrawal of the intervention for correct intraverbals. He demonstrated 66% non-overlapping data points between the generalization and maintenance sessions.

4.2.2.2 Conversation B.

For Conversation B, Darrel's baseline frequency of responding was 2 to 4 correct out of 10. Upon entering the intervention phase, he attained the mastery criterion of 80% correct responses for three consecutive days in 11 sessions. As seen in Figure 2, Darrel demonstrated an increasing trend and an increasing level of responding. The overall level of responding in the intervention condition ($M=6.6$) was higher than the level seen in the baseline condition ($M=2.08$). In addition, he showed an increasing trend in correct intraverbal responses gradually and continuously after entering the intervention phase (baseline range=4; IV range=7). When assessing non-overlapping data between baseline and intervention phases, Darrel demonstrated 95% non-overlapping data points.

Darrel generalized the target intraverbals taught via transfer of stimulus control procedures and peer-prompter training. He participated in three generalization sessions with his novel conversation partner, Tamitra, and showed increased level ($M=9.3$) from the previous condition (IV $M=6.6$). Of the 15 sessions in the intervention and generalization phases, Darrel demonstrated 85% non-overlapping data points.

During maintenance phase, Darrel maintained the target intraverbals over time. The researcher collected three maintenance sessions two weeks after intervention in the training setting. Although he showed a decreasing level from the previous condition—generalization phase—, his overall level of responding in the maintenance condition ($M=8.6$) was higher than the intervention phase ($M=6.6$). In addition, 66% of the data points from the generalization to the maintenance phase were non-overlapping.

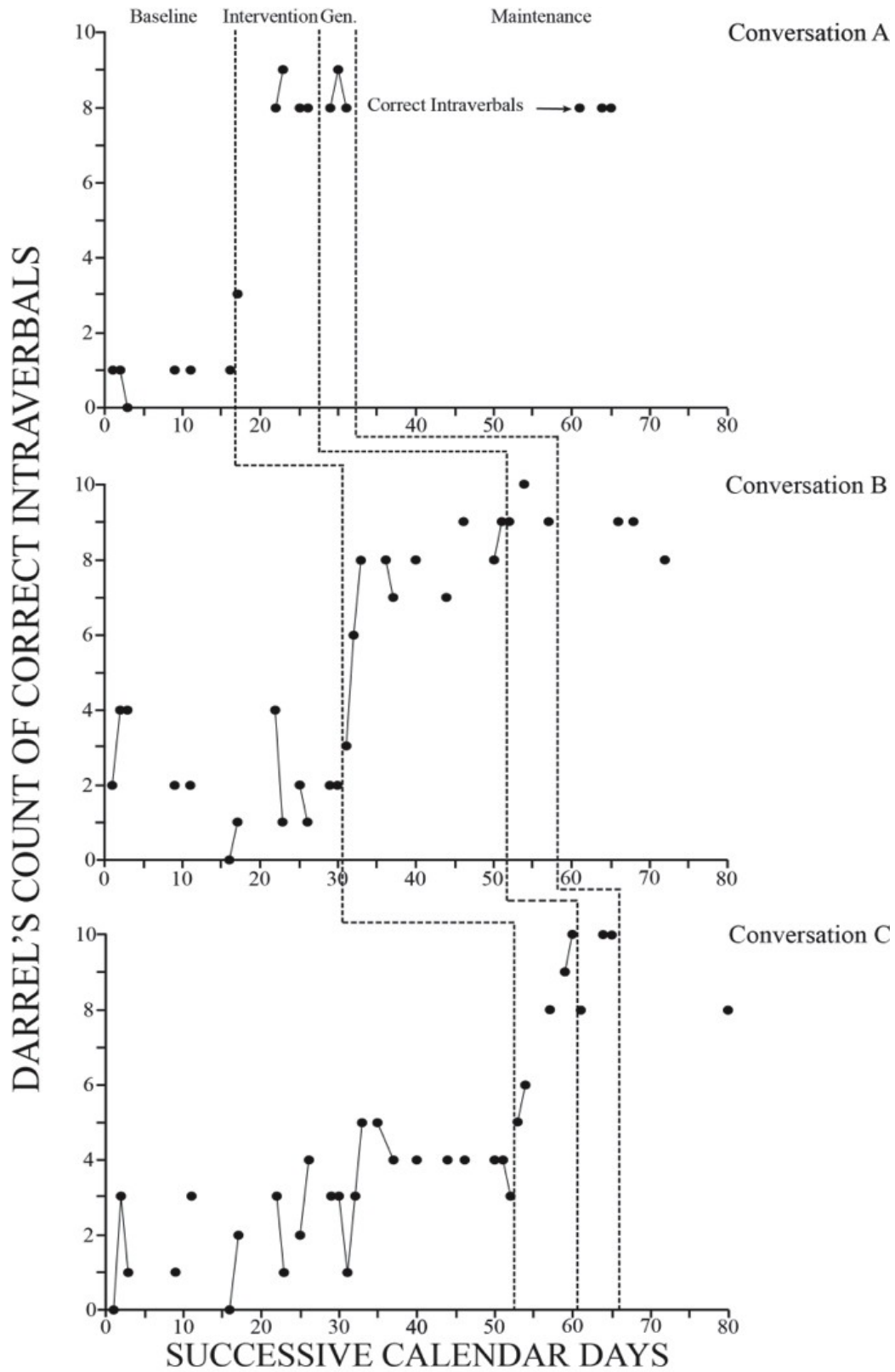
4.2.2.3 Conversation C.

Darrel's baseline performance for Conversation C was higher than for the previous conversations. He initially emitted 1 to 3 correct intraverbals during the baseline. However, a slight response generalization effect occurred following the intervention on Conversation B, with Darrel's number of response increasing from 3 to 5 correct intraverbal responses, and ultimately stabilizing at 4 correct responses. With the application of the intervention, he reached the mastery criterion of 80% accuracy for three consecutive days. He was able to emit eight out of 10 correct intraverbal responses in six sessions. Examination of the data in Figure 2 indicates that there was an overall increase in level from baseline ($M=2.7$) to the intervention phase ($M=6.8$). Immediately after the intervention, he demonstrated an increasing trend throughout the entire intervention phase (baseline range=5; IV range=7). Darrel displayed 100% non-overlapping data points for correct intraverbals from the intervention to baseline condition.

Darrel took part in three generalization sessions with his typical peer partner in the training setting. Similar to the previous two conversations, his level of correct responding continued to increase in the generalization condition ($M=9.3$), compared to the intervention levels ($M=6.8$), indicating that he was able to emit correct intraverbals even with a novel typical peer. The percentage of non-overlapping data points from the intervention to generalization were 77%.

During the maintenance session, the researcher was able to conduct only one maintenance probe for Conversation C because it was the end of school year. He maintained 8 out of 10 correct intraverbals two weeks after the intervention. Of the four sessions in the generalization and maintenance phases, he demonstrated 75% non-overlapping data points.

Figure 2: Number of Correct Intraverbals for Darrel



4.3 THE RATE OF ADULT-DELIVERED PROMPTS

In Figure 3 and Figure 4, data represent the number of adult-delivered prompts per minute occurring during the condition of peer-prompter sessions for Jack and Darrel. The duration of peer-prompter session was between 2 and 4 minutes. To calculate the number of adult-delivered prompts per minute, the frequency of verbal prompts divided by time. The rate of adult prompts Jack needed to emit correct intraverbal responses across three conversation scripts is displayed in Figure 3. Figure 4 shows the rate of teacher prompts Darrel received to respond to his peers' conversation statements correctly.

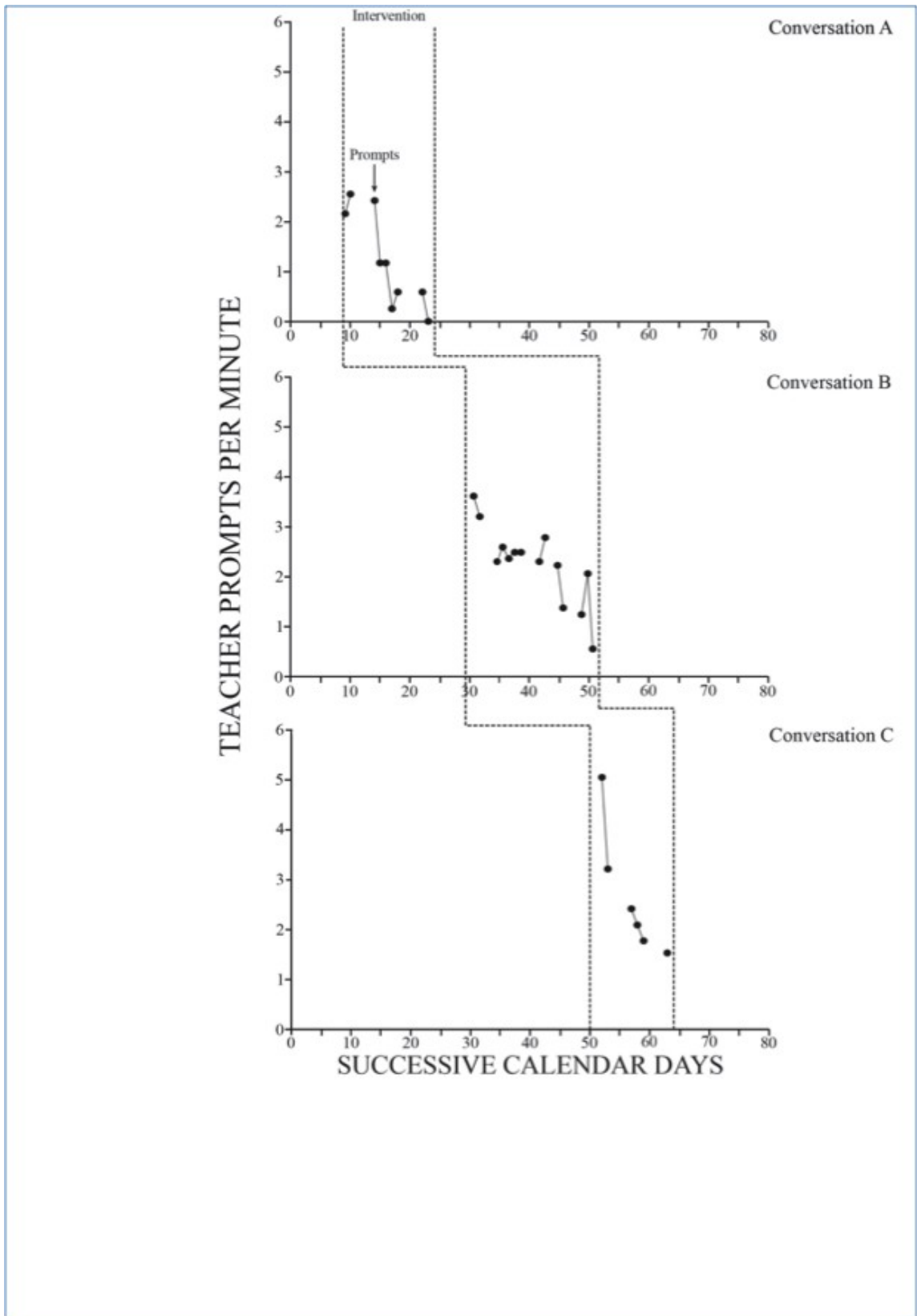
4.3.1 Jack

When given 10 conversation statements to Jack by his peer, the number of teacher prompts per minute he needed to converse with his peer reduced to zero verbal prompting immediately after the intervention with Conversation A. The range of teacher prompting for this conversation script was 0-2.6, with a mean of 1.2. This decreased rate of prompts is an indication that Jack was able to use the target intraverbal responses without receiving assistance from the researcher.

Of the 14 peer prompter sessions for Conversation B, the number of adult prompts per min needed for Jack to respond to his peer's conversation statements dropped from 3.6 verbal prompts per min to 0.6 verbal prompt per min. He needed an average of 2.2 prompts for each session to engage in conversation with his peer.

Similar to the previous two conversations, the number of teacher prompts Jack needed to emit correct intraverbals decreased following the intervention with Conversation C. The range of adult-delivered prompts was 1.5-5.1 and he needed an average of 2.6 prompts per session.

Figure 3: Teacher Prompts Per Minute for Jack



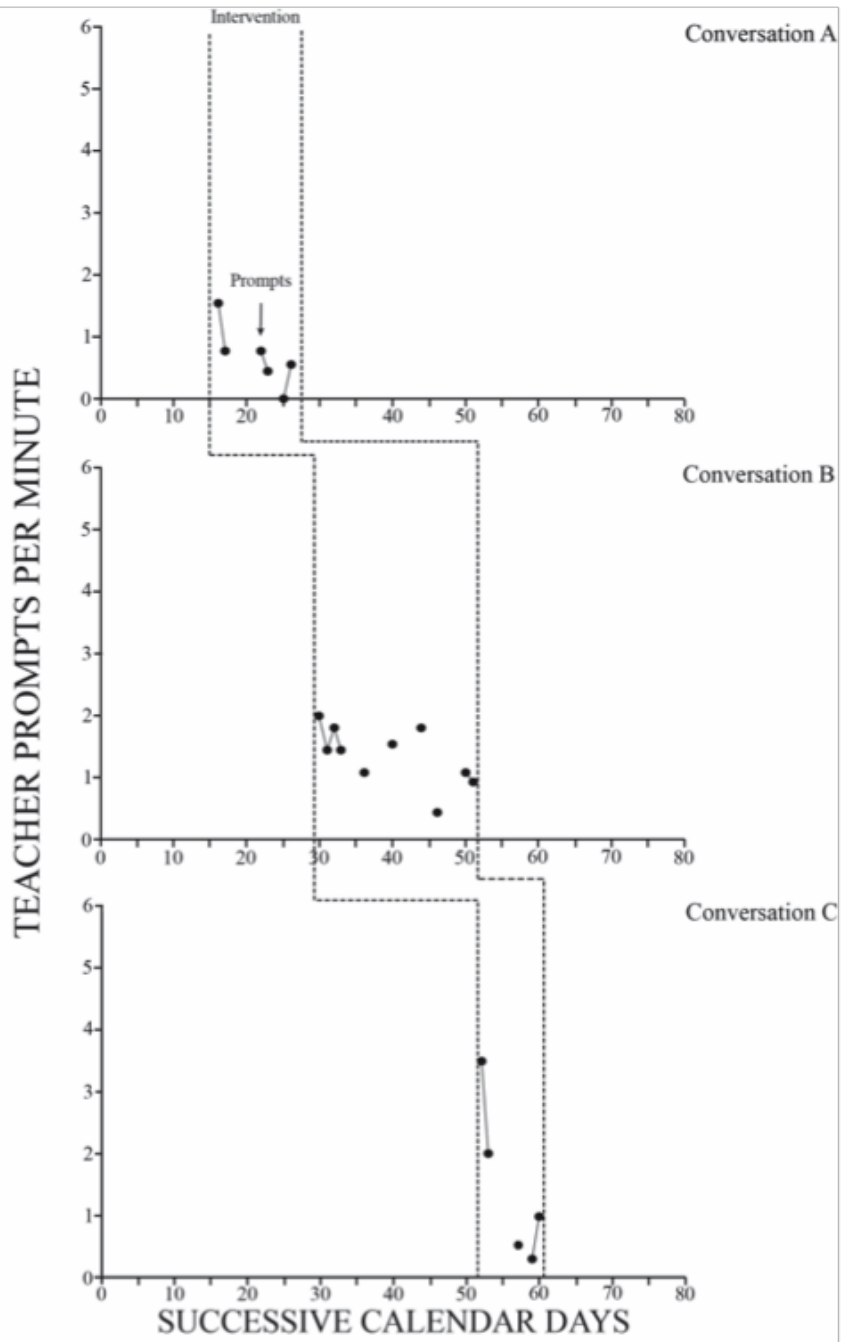
4.3.2 Darrel

During peer prompter sessions, the number of adult prompts provided to Darrel reduced from 1.4 verbal prompts per min to 0.4 verbal prompts per min upon the intervention with Conversation A. Of the six sessions, he needed an average of 0.5 prompts per session to give appropriate intraverbal responses to his peer.

Once Darrel reached the mastery criterion of 80% correct responding for three consecutive days in Conversation A, the intervention was applied to second conversation. The number of prompts delivered to teach the target intraverbals reduced to 0.9 verbal prompts per min from 2.02 verbal prompts per min. Darrel needed an average of 1.3 prompts per min to engage in conversation with a typical peer.

Following the intervention with Conversation C, Darrel required a few adult prompts to respond to his peer's conversation initiations. The range of teacher prompts for Conversation C was 0.3-3.4 per minute, with a mean of 1.4. This reduced number of prompts indicated that his reliance on verbal prompts to respond to social communication decreased as he gained more control over interactions with his peer during peer prompter sessions.

Figure 4: Teacher Prompts Per Minute for Darrrel



4.4. SOCIAL VALIDITY

At the conclusion of the study, the researcher administered a social validity questionnaire consisting nine questions regarding the quality of conversational interactions between students with ASD and their peers. Two special education teachers, two general education teachers and a paraprofessional watched three 2-min videos of two different students with autism and their peers. Three video clips showing a student's performance were recorded before intervention or after intervention, but the educators were blinded to the experimental conditions. After watching the three video clips, the educators rated the conversation skills of the students with ASD and his peers using a 4 point Likert-type scale (i.e., 1=strongly disagree, 2= disagree, 3=agree, and 4=strongly agree).

Table 3 displays mean and range of the educator's rating of the quality of conversational interactions. In Table 3, B means baseline while PI means post intervention. All five teachers reported that the participants gave more appropriate responses to their peer's conversation statements after participating in the study. In addition, their language abilities (e.g., giving a full sentence response to questions) and their interest in having a conversation with their peers increased. Some comments made by educators for Jack and Darrel were as follows: "Jack's response was more natural, to the prompt about the dog having friends. He did not use the script. He gave his own answer." "Darrel was able to generate authentic conversational responses appropriate to the topic. " Darrel attends to conversation throughout the duration."

The educators also rated the quality of conversation skills of peers without disabilities. The teachers indicated that the peers showed positive changes in social interactions with the students with ASD. One of the comment written by an educator was "Peer had previously been unable to

carry an appropriate conversation with peers with disabilities. The video displays growth in his language and conversation abilities.” Another teacher reported that the peer displayed appropriate emotional response inflection and facial expression and the peer also sustained eye contact.”

Table 6: Mean and Range of Teacher Ratings of Conversation Skills of Children with ASD and Their Peers

	Jack		Darrel	
	B	PI	B	PI
Conversation Skills of Children with Autism				
1. My student gives more appropriate responses to his peer's questions or comments.	2 (1-3)	4	2.3 (2-3)	4
2. My student has improved language performance after participating in this study	2 (1-3)	4	2.6 (2-4)	4
3. My student uses verbal abilities similar to his peers without disabilities.	1.5 (1-2)	4	2.6 (2-3)	3.6 (3-4)
4. My student demonstrates interest in having a conversation with his peers.	3	4	2.6 (2-4)	3.6 (3-4)
5. Conversation between my student and peers are similar to those of students without disabilities	1.5 (1-2)	4	2.6 (2-3)	4
Conversation Skills of Peers				
1. Peer shows interest in what the student with autism is saying.	3.5 (3-4)	4	2.3 (2-3)	3.6 (3-4)
2. Peer initiates a conversation more with the student with autism.	3	4	2.6 (2-3)	3.3 (3-4)
3. Peer is responsive to the student's verbal communication.	3.5 (3-4)	4	2.3 (2-3)	3.6 (3-4)
4. Peer shows positive changes in social interactions with the student with autism.	3.5 (3-4)	4	2.3 (2-3)	4

Note: B=baseline, PI=post intervention

5.0 DISCUSSION

Conversational skills play a crucial role in establishing and maintaining peer relationships (Beaulieu, Hanley, & Santiago, 2014). Much of a child's conversation involves intraverbal behaviors including answering social questions, responding to statements, making comments, and telling stories (Partington & Bailey, 1993). The improvement of such intraverbal behaviors may help children with ASD to engage in social interaction. Particularly, children with ASD who are educated in inclusive settings with their peers without disabilities can have opportunities to develop meaningful social relationships if effective instructional strategies to teach intraverbals are implemented. A number of research studies have shown that the use of transfer of stimulus control procedures resulted in successful acquisition of intraverbals in children with autism (Vedora et al., 2009; Ingvarsson & Hollobaugh, 2011; Finkel & Williams, 2001; Goldsmith et al., 2007; Ingvarsson et al., 2012; Ingvarsson & Hollobaugh, 2010). Despite improvements in the acquisition of intraverbal behaviors when using transfer of stimulus control procedures, limited generalization and maintenance were observed in the literature. The researcher hypothesized that the addition of peer-mediated interventions, such as peer-prompters, to the transfer of stimulus control procedures would promote generalization of intraverbals from adults to peers. Thus, the purpose of this study was to evaluate the effects of transfer of stimulus control procedures and a peer prompting procedure on the acquisition and generalization of intraverbals across peers without disabilities.

This study expanded the existing literature on teaching intraverbal responses in several ways. First, no research study on intraverbal training has included additional strategies to promote the generalization of intraverbals in children with ASD. This study aimed to combine the elements of peer-mediated intervention to achieve generalized responding as observed in the research of Beaulie et al. (2014). However, this investigation differed from the study of Beaulie et al. (2014) in that the peers without disabilities received instruction in prompting and reinforcing the intraverbal behaviors of children with ASD. In this investigation, the peers without disabilities were taught to initiate a conversation using pre-selected 10 conversation statements, to allow 5s to the participants to give a response, and to respond to the participants with ASD as observed in Krantz et al. (1989). The intervention combined the use of verbal prompts, a 4-s constant time delay, an error correction procedure, a peer-prompting procedure (i.e., peers deliver the verbal discriminative stimulus), a behavior specific praise, and tangible reinforcers.

Second, unlike the studies of Finkel and William (2001) and Emmick et al. (2010), the current investigation focused on teaching intraverbal responses based on thematically-related conversation topics such as superheroes and dinosaurs. Students with ASD in the studies of Finkel and William (2001) and Emmick et al. (2010) were taught to give single responses to a variety of social questions. (e.g., “What is your name?” and “What movies do you watch?”). However, it is difficult to teach a specific intraverbal response to every conversation statement using transfer of stimulus control procedures (Emmick et al., 2010). Thus, this investigation taught a variety of intraverbal responses around a single topic that helped children with autism maintain social interaction with their peers.

Third, this investigation expanded the literature by assessing the social validity of treatment outcomes. Research has indicated that transfer of stimulus control procedures appeared to be effective in teaching desired intraverbal responses; however, there is a lack of social validity data seen in the literature. To address this need, a social validity questionnaire was implemented to assess the quality of conversational interactions of children with ASD and their typical peers.

Specifically, research questions that are addressed in this section are: What effect do transfer of stimulus control procedures and the peer prompter training have on the acquisition of intraverbals? What effect do transfer of stimulus control procedures and the peer prompter training have on the generalization of intraverbals across peers without disabilities? And, What effect do transfer of stimulus control procedures and the peer prompter training have on the number of adult-delivered prompts during peer-prompter sessions?

Question 1. What effect does transfer of stimulus control procedures and peer prompter training have on the acquisition of intraverbals?

Examination of the data in Figure 1 and Figure 2 indicates that both participants demonstrated improvement in giving contextually appropriate intraverbal responses following the use an intervention package consisting of transfer of stimulus control procedures and a peer-prompting procedure. The participants with ASD demonstrated increased response levels and an improving trend after they received a structured training on how to respond to conversational statements and practiced the same intraverbal responses with one typical peer partner in the context of conversation. Findings support prior research on prompting and prompt fading procedures (Vedora et al., 2009; Ingvarsson & Hollobaugh, 2011; Finkel & Williams, 2001; Goldsmith et

al., 2007; Ingvarsson et al., 2012; Ingvarsson & Hollobaugh, 2010) and the importance of peer-mediated intervention for the transference of skills to novel peers without disabilities (Harper, Symon & Frea, 2008).

The results of this study show that the use of a peer-mediated intervention along with the use of intensive individualized social-communication intervention can result in quick acquisition of skills for children with very limited social-communication skills (Thieman & Goldstein, 2004). In this study, the participants were able to reach the mastery criterion in a few teaching sessions with a few incorrect responses after they received a combination of interventions. The average number of sessions took Jack to attain the mastery criterion was 9 per behavior. The mean number of sessions took Darrel to respond to his conversation partner with 80% accuracy was 7 per conversation script. The reason why the participants learned the target intraverbals in a short time period may be related to the fact that they had many opportunities to practice them. Since both participants received instruction on one conversation script twice a session the number of learning opportunities may have influenced the outcomes associated with the acquisition of intraverbals.

Additionally, one possibility for increased number of correct intraverbal responses is compliments given by the typically-developing peers. Although the typical peers were not taught to give compliments to the participants with ASD, they spontaneously provided positive attention for correct responses. During peer-prompter sessions, peers often delivered compliments in verbal (e.g. "Good job.") or physical form (e.g., giving high fives). Since research has demonstrated that peer-delivered compliments such as high fives can lead to increased social engagement between children with ASD and their peers (McEvoy, Norddquist,

Twarddosz, Heckaman, Wehby, & Denny, 1988), it is likely that these compliments may have made a positive impact on the behavior of the participants.

Finally, the participants with ASD maintained the treatment gains even though the intervention was not in place. The researcher collected three maintenance data points per conversation script with the exception of Darrel's third conversation script in that only one maintenance data was obtained. Following the withdrawal of the intervention, Darrel demonstrated correct responding similar to the intervention phase over time. In contrast to Darrel, the researcher was able to collect one data point per conversation script for Jack except for the third conversation script. Similarly, Jack maintained the gains observed during the intervention condition, indicating that the combined interventions appeared to contribute to the maintenance of the effects of the intervention in the absence of frequent adult prompting.

Question 2. What effect does transfer of stimulus control procedures and peer prompter training have on the generalization of intraverbals across peers without disabilities?

Programming for generalization in intraverbal training has received no attention in the literature. In this investigation, a peer prompting procedure in which typical peers presented the verbal discriminative stimulus and maintained the conversation was used to provide instruction and practice opportunities for children with ASD (Timler, Vogler-Elias, & McGill, 2007). The present data indicate that addition of the peer prompter procedure can result in generalized intraverbal responding. Both participants demonstrated similar or increased intraverbal responding in the generalization probes compared to the intervention phase. This result confirmed previous research indicating that a combination of intensive instruction with a peer-mediated intervention may be effective in the acquisition and generalization of acquired skills

(not involving the intraverbal training) (Thieman & Goldstein, 2004; Hundert, Rowe, & Harrison, 2014; Kamps, Mason, Thieman-Bourque, Feldmiller, Turcotte, & Miller, 2014). For example, Hundert et al. (2014) evaluated the generalized effects of social script training alone and combined with peer-mediated intervention on social behaviors of three children with ASD. The results of this study showed that the social script training alone was effective in increasing social behaviors of children with ASD. However, it did not result in generalization of the skills. When social scripts training combined with peer-mediated intervention, three children with ASD demonstrated the generalization of skills across novel settings.

In previous research, children with ASD successfully acquired conversational intraverbals using transfer of stimulus control procedures; however, the gains observed in the training did not transfer, or generalize, to other people and settings (Emmick et al., 2010; Finkel & Williams, 2001). This current investigation yielded positive increases in generalization of intraverbals across peers. For Darrel, these increases may be due to the familiarity of typical peers who had been interacting with him for two years. This familiarity may have enhanced the generalization of correct responses across a novel peer.

In addition to stimulus generalization, the participants in this study displayed response generalization. During intervention, both participants emitted unscripted responses to peers' conversation statements. This result shows that the participants were not simply giving intraverbal responses by rote, but were demonstrating novel intraverbal responses. Overall, the addition of peer prompter training to the contrived teaching approach appeared to overcome the disadvantage of the structured interventions: limited opportunities to practice social skills with peers.

Question 3. What effect does transfer of stimulus control procedures and peer prompter procedure have on the number of adult-delivered prompts during peer-prompter sessions?

The use of transfer of stimulus control procedures and a peer prompter training appeared to be effective in reducing the adult-delivered prompts and increasing peer-mediated interaction. During the peer prompter sessions, the participants had 10 opportunities to emit the target intraverbals. Examination of the data in Figure 3 and Figure 4 show that there is a decreasing trend and a decreasing level for the adult-delivered prompts for both participants. One possible explanation for this outcome is that implementing peer practice immediately after individual intraverbal training may have influenced the number of adult-delivered prompts per min as well as unprompted intraverbals emitted during the peer-prompter session. It is possible that the use of verbal prompting and reinforcement assisted children with ASD in transferring intraverbal responses learned in an adult prompting setting to a setting in which verbal prompts were not provided—unless the participant needed verbal prompts to emit a correct response.

The use of peer-mediated intervention has been found to be effective in improving social skills; however, peer-mediated interventions have been criticized for high dependence on teacher prompts for peers to initiate social interaction (Odom & Watts, 1991). In this investigation, typical peers received a few or no adult-prompts to initiate a conversation during probe sessions and peer-prompter sessions, thus increasing the quality of peer interactions. The reason why typical peers required less adult prompts may be related to fact that the use of written cue could be less intrusive than adult-delivered verbal prompts. Prior research on peer-mediated intervention has shown that teacher prompts and direct involvement may evoke social responses while the peer initiation should be the one bring correct responses (Odom & Watts, 1991). The use of written cue for peer initiation may make the adult a less discriminative stimulus for

intraverbal responses and increase the salience of the peer as the discriminative stimulus (Odom & Watts, 1991). This increased salience of the peer can facilitate the maintenance of intraverbal responses over time without receiving adult prompts. Therefore, the use of written cues for peer may minimize the frequency of teacher prompts and increase positive social interaction between children with ASD and their peers (Thiemann & Goldstein, 2001; Thiemann & Goldstein, 2004).

5.1 LIMITATIONS

Despite the very favorable outcomes observed in this study, there are several limitations that must be considered in interpreting the results of the study. First, there is a slight undesired response generalization across conversation topics which occurred for both participants. The experimenter selected the target intraverbals that were functionally independent of one another; however, a few correct intraverbal responses occurred in untrained conversation scripts, thus limiting experimental control. Although undesired response generalization was observed for one or two targeted intraverbals, the internal validity of the study may have affected by this response generalization.

Second, even though the treatment fidelity for transfer of stimulus control procedures and peer-prompter sessions were evaluated, there is no treatment integrity for the peer training sessions. The lack of fidelity treatment for peer training makes it difficult to replicate the peer training procedures used with the desire of gaining the same results (Gresham, Gansle, & Noel, 1993).

Third, this study included multiple treatment inferences (Tawney & Gast, 1984). The participants with ASD received a multi-component intervention composed of the following

strategies: a) verbal prompting, b) a 4s constant time delay, c) error correction, d) a peer prompter procedure, d) a behavior specific praise, and e) tangible reinforcers. Because of this multiple-component intervention, it is unknown which strategy or combinations led to the skill acquisition and promoted the generalization of treatment gains.

5.2 IMPLICATIONS FOR PRACTITIONERS

There are several implications for practice. First, the results of this current investigation revealed that the addition of naturalistic elements such as the use of typical peers and the preferred conversation topics to the transfer of stimulus control procedures could be effective in the acquisition and generalization of intraverbals in children with ASD. Practitioners who work with children with ASD and wish to teach generalized social skills may consider the use of these natural elements to encourage practice and promote generalization of treatment gains (Timler et al., 2007).

Second, the peer training required less work and effort to teach peers how to initiate and respond to conversation of the participants with ASD. Since only two 20-min individual training were sufficient to train peers, practitioners may train peers to create opportunities for children with ASD to practice social skills in inclusive settings.

Third application may be the need to find alternative ways to reduce adult-delivered prompting for typical peers. Peers in this study used written text cues to start conversation with the participants with ASD. Although the use of written conversation scripts to prompt peer initiations decreased the need for frequent adult prompting, this element of the intervention appeared to limit the duration of conversation. Instead of reading conversation lines from a

paper, practitioners may ask peers to carry a few index cards with conversation initiations. Using index cards would be a feasible intervention component for teaching conversation skills and may allow peers use their own conversation statements to maintain conversation.

5.3 FUTURE DIRECTIONS

The treatment package implemented in this study targeted the acquisition and generalization of intraverbal skills. Previous studies examining the effects of transfer of stimulus control procedures on acquisition did not incorporate additional strategies for generalization. Since this current investigation indicated promising outcomes strategies combined with peer-mediated intervention should continue to be a focus of future research in order to promote generalization of social-communication skills. Additionally, since this study included limited data points for maintenance, long-term observations to evaluate the maintenance of intraverbals are in need of future research. Finally, a multiple component intervention was employed and it is unknown which element of the treatment package had impact on behavior of the participants. Future research may need to compare the effectiveness of transfer of stimulus control procedures alone and combined with peer prompter to assess which procedure promote better generalization of intraverbals across people and setting.

5.4 CONCLUSIONS

The overall goal of the combined transfer of stimulus control procedures with a peer-prompter training was to provide opportunities for students to acquire and practice conversational intraverbals with peers and to promote generalization of intraverbals to typical peers. This study is the first to program for generalization of intraverbals through the use of peer-mediated interventions. Despite several limitations identified for this investigation, examination of the participants' data demonstrates promising outcomes that the combination of transfer of stimulus control procedures and peer-initiation training can result in socially-validated conversational intraverbals for elementary-aged students with ASD.

Table 7: Literature Review Summary

Article	Participants	Dependent Variable	Independent Variable	Outcome	Generalization& Maintenance
Vedora, Meunier, & Mackey, 2009	2 boys with ASD, 7 years old	The accuracy of a participant's one word responses to questions	Textual prompts and a progressive time delay versus echoic prompts and a progressive time delay	Textual prompts and echoic prompts were effective in teaching intraverbals; however, textual prompts were more efficient than echoic prompts.	Generalization across people was observed. No maintenance data.
Ingvarsson & Hollobaugh, 2010	4 boys with ASD, 4-10 years old.	The number of IDKPTM responses and the number of correct answers to questions	Echoic prompting and constant time delay	Two out of four participants gave IDKPTM response to the unknown questions and acquired correct answers to the previously unknown questions.	Three out of four participants generalized the IDKPTM response with untrained questions across people and settings. No maintenance data.
Ingvarsson & Hollobaugh, 2011	3 4-year-old boys with ASD.	The number of correct intraverbals	Echoic prompts and a 5-s constant time delay versus picture prompts and a 5-s constant time delay.	All 3 participants acquired the target intraverbals more rapidly using picture prompts.	Generalized across classroom teachers. No maintenance data.

Table 7 Cont.

Emmick, Cihon, & Eshleman, 2010	3 boys with ASD; 6, 14, and 15 years old.	The number of timings to reach frequency aims, the number of correct responses to reach criterion for mastery, and the number of teaching trials to criterion.	Reading and prompts versus prompts condition.	fluency and textual condition only	Two out of three participants acquired intraverbals in fewer trials using fluency instruction and textual prompts.	Limited maintenance and generalization occurred.
Humphreys, Polick, Howk, Thaxton, & Ivancic, 2013	2 boys with ASD, 4 and 7 years old.	The percentage of correct intraverbals to questions.	Least to most prompting procedure with repeated discriminative stimulus versus least to most prompting without repeating discriminative stimulus (presenting verbal stimuli once).	No difference between two conditions, all participants acquired the target intraverbals	Participants maintained intraverbals varying between 33%-66% correct. No generalization data.	
Goldsmith, LeBlanc, & Sautter, 2007	3 boys with ASD; 4, 5, 7 years old.	The number of correct responses to the question for a given category.	Picture prompts, 3-s constant time delay and differential reinforcement.	All participants acquired the target intraverbals with varying performance.	Limited generalization and maintenance was observed.	
Ingvarsson, Cammilleri, & Macias, 2012	4 boys with ASD, 4-10 years old.	The number of correct responses to the questions about	Picture prompts and a 5s constant time delay versus verbal	All participants met the mastery criterion more	No maintenance and generalization data	

Table 7 cont.		state birds.	prompts and a 5s constant time delay.	rapidly in the picture prompt condition
Ingvarsson & Le, 2011	4 boys with ASD, 3-7 years old.	The number of prompted and unprompted correct answers to questions.	Verbal, textual, and picture prompts were compared along with the use of a 5s constant time delay.	All prompting procedures were effective in teaching intraverbals; however, verbal prompts resulted in fewer trials to criterion.
Finkel & Williams, 2001	A 6-year-old boy with ASD.	The number of correct responses to questions.	The comparison of textual and verbal prompts. A backward fading procedure was used.	Both prompting procedures were effective in establishing intraverbals; however, textual prompts were much more effective.
Valentino, Shillingsburgh, & Call, 2012	A 13-year-old girl with ASD and Down Syndrome.	The percentage of correct intraverbal responses to questions.	The comparison of two conditions: echoic prompts only and echoic prompts and a modeled prompt (sign)	The use of modeled prompts and echoic prompts produced faster acquisition of intraverbals.
				Three participants maintained the gains demonstrated during the training and generalization across people occurred.
				The participants maintained the intraverbals. No generalization data.
				No maintenance and generalization data.

APPENDIX A

CONVERSATION EXAMPLE USED IN THIS INVESTIGATION

Peer: (Name), how cool would it be if a super hero came to your house?

Child: That would be so cool!

Peer: Imagine that Batman is in your house.

Child: I would be so excited.

Peer: I would help him find the Joker.

Child: I would help him too!

Peer: Ah yeah! I wish I had a super power don't you?

Child : Yeah I wish I could fly.

Peer: Why?

Child: So I could go anywhere I want.

Peer: Where do you want to go if you have super power?

Child: I want to go to Batman's cave.

Peer: I want to be invisible so I could sneak around without anyone seeing me!

Child: That is neat!

Peer: I want to be batman for Halloween

Child: I want to be batman too.

Peer: I like his cape.

Child: I like his mask.

Peer: Oh I like his mask too. Maybe, we can trick or treat together next year.

Child: That would be great!.

APPENDIX B.

FIDELITY CHECKLIST FOR PEER TRAINING

Trainer _____

Observer _____

Date _____

Participant _____

Put “ ” if procedure is observed and put “ ” if procedure is not observed.

Session 1: Introduction

(Kamps, Kravits et al., 2002)

_____ 1. Describe characteristics of Autism Spectrum Disorder retrieved from Centers for Disease Control and Prevention website (<http://www.cdc.gov/ncbddd/kids/autism.html>), *Kids' Quest for Autism*.

_____ Children with autism may not make eye contact and may want to be alone.

_____ Repeat words or phrases over and over.

_____ Children with autism may have problems dealing with changes to their daily routines.

____ Children with autism may repeat actions over and over again.

____ Children with autism may have problems being friendly.

____ Have unusual reactions to the way things sound, smell, taste, look, or feel.

____ 2. Read book, *The Autism Acceptance Book: A Friend to Someone with Autism* by Ellen Sabin.

____ Peers will answer questions from story.

____ 3. Introduce the purpose of a peer prompter.

____ 4. Have the conversation partners generate ways they can include children with autism in daily activities.

____ 5. List on chart.

Session 2: Conversational Scripts

(Adapted from *Skillstreaming the Elementary School Child*, McGinnis & Goldstein, 1997)

____ 1. Introduce conversational scripts

____ 2. Describe the purpose of conversational scripts.

____ Discuss the given 10 conversation lines including questions and answers.

____ Model conversational scripts

____Role-play the complete conversation with the classroom teacher.

____Set-up role-play for peer participants

____Provide feedback

____Continue role-playing for all conversational scripts

____3. Describe the baseline sessions.

____Discuss what to do when a participant gives a correct response.

____Discuss what to do when a participant does not give a response or gives incorrect response.

____ Example: Instructor: “Sometimes when you ask a question to your friends they do not give a response or give incorrect response. You have to ask the next question from the given questions. What do you have to do?”

Peer: Ask the next question.

Instructor: Yes, you ask the next question.

Instructor demonstrates the skill using another peer and provides both examples (asking the next question) and non-examples (saying it is incorrect or walking away after first attempt).

APPENDIX C

FIDELITY CHECKLIST FOR PEER-INITIATION SESSIONS

Trainer _____

Observer _____

Date _____

Participant _____

Circle the appropriate answer to indicate if procedure is observed or not observed.

<p>KEY</p> <p>Y= Yes</p> <p>N=No</p> <p>N/A: Not Applicable</p>	
<p>1. Did instructor set up all materials prior to instruction? (e.g., a video recorder device, a paper sheet showing the target questions, cue cards showing both questions and answers, a data sheet, and pencil)</p>	<p>Y N N/A</p>
<p>2. For a cold probe procedure (i.e., testing all target questions), did a peer ask all target questions to a participant with ASD before beginning to instruction?</p>	<p>Y N N/A</p>

3. At the beginning of the instruction, did peer ask the first conversational question from the given scripts?	Y	N	N/A
4. Did peer give 5 seconds to allow participant to respond?	Y	N	N/A
5. If peer does not ask a question did instructor provide subtle verbal instruction (e.g., “it is your turn.” “Try again.”)	Y	N	N/A
6. If peer does not response to the subtle verbal instruction, did instructor provide an explicit instruction (e.g., “Ask your friend what is his favorite movie?”)?	Y	N	N/A
7. If the participant gives a correct response to the peer’s question or statement, did the instructor deliver reinforcement (e.g., a descriptive praise) and then the peer continue with the next script?	Y	N	N/A
8. If participant does not respond or makes errors, did instructor administer error correction (i.e., instructor presents the question and verbal prompt simultaneously and then peer re-present the same question without delivering prompt)?	Y	N	N/A
9. Are the steps starting from 3 to 9 followed for all target questions or statements?	Y	N	N/A
10. Once the students complete conversation did instructor deliver the final reinforcement to them (e.g., computer game)?	Y	N	N/A

Percent correct steps	_____/10
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APPENDIX D

FIDELITY CHECKLIST FOR TRANSFER OF STIMULUS CONTROL PROCEDURES

Trainer _____

Observer _____

Date _____

Participant _____

Circle the appropriate answer to indicate if procedure is observed or not observed.

<p>KEY</p> <p>Y= Yes</p> <p>N=No</p> <p>N/A: Not Applicable</p>	
<p>1. Did you set up all materials prior to instruction? (e.g., a video recorder device, a paper sheet showing the target questions, cue cards showing both questions and answers).</p>	<p>Y N N/A</p>
<p>2. Did you administer a brief stimulus preference assessment before the instruction (e.g., What do you want to work for today?)?</p>	<p>Y N N/A</p>
<p>3. Did you place 20% of target card pile (i.e., intraverbals) and 80 % known colored card pile in front of</p>	<p>Y N N/A</p>

you on the table?			
4. Did you present discriminative stimulus with echoic prompt (e.g., “What is your favorite TV show?” is presented along with the verbal cue, “ Say SpongeBob.”)?	Y	N	N/A
5. Did you present transfer trial after prompt trial (e.g., “What is your favorite TV show” is asked without delivering prompt)?	Y	N	N/A
6. Did you administer distract trial after transfer trial (e.g., present demands from the child’s current mastered repertoires)?	Y	N	N/A
7. Did you administer check trial after distract trial to see if the child can give independent response (e.g., “What is your favorite TV show?” is presented without prompt)?	Y	N	N/A
8. If the student does not respond or makes errors, did you administer error correction by going back to step 5 and starting over (e.g., error-prompt-transfer-distract-check)?	Y	N	N/A
9. Once the student gives correct response with and without prompting did you deliver reinforcement?	Y	N	N/A
10. Did you reinforce differentially (better reinforcement) target responses?	Y	N	N/A
11. Did you mix the easy tasks with target task (e.g., at least one receptive, one motor imitation, one tact, one	Y	N	N/A

intraverbal, and one echoic for each trial)?	
12. Did you vary the reinforcement?	Y N N/A
Percent correct steps	_____/12

APPENDIX E

MULTIPLE STIMULUS WITHOUT PLACEMENT PREFERENCE ASSESSMENT

FIDELITY OF CHECKLIST

Trainer _____

Observer _____

Date _____

Participant _____

Circle the appropriate answer to indicate if procedure is observed or not observed.

KEY Y= Yes N=No N/A: Not Applicable		
1. Did you present 5-8 reinforcing items in a linear array approximately 2 feet from the student and ask the student to pick one?	Y	N N/A
2. If the student picked one of the items, did you allow the student access to the item for 30seconds?	Y	N N/A
3. If the student attempted to pick additional items did you block the student from accessing them during that particular trial?	Y	N N/A

4. After the student consumes or play with the item for 30 seconds, did you remove it from the student and remove it from the array?	Y	N	N/A
5. Prior to next trial, did you rotate the sequence of the remaining items?	Y	N	N/A
6. Did you apply second trial with the remaining items?	Y	N	N/A
7. Did you continue until all items are selected or until the student does not approach any of the remaining items within 30 seconds?	Y	N	N/A
8. Did you administer steps from 1 to 7 three times in a day?	Y	N	N/A
Percent correct steps	_____/8		

APPENDIX F

SOCIAL VALIDITY CHECKLIST FOR TEACHERS

Student # _____

Video # _____

Likert Scale

Directions: Please rate the student with autism's conversation with his peer.	Strongly Disagree	Disagree	Agree	Strongly Agree
1. My student gives more appropriate responses to his peers' questions or comments after participation in the study.	1	2	3	4
2. My student has improved language performance after participating in this study (e.g., gives a full sentence response to questions or comments).	1	2	3	4
3. My student uses verbal abilities (e.g., answering questions) similar to his peers without disabilities.	1	2	3	4
4. My student demonstrates interest in having a conversation with his/her peers.	1	2	3	4
5. Conversation between my student and peers are similar to those of students without	1	2	3	4

disabilities.				
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6. General comments about my student's performance in the video clip

Directions: Please rate the peer's conversation with the student with autism.	Strongly Disagree	Disagree	Agree	Strongly Agree
1. Peer shows interest in what the student with autism is saying.	1	2	3	4
2. Peer initiates a conversation more with the student with autism.	1	2	3	4
3. Peer is responsive to the student's verbal communication.	1	2	3	4
4. Peer shows positive changes in social interactions with the student with autism.	1	2	3	4

5. General comments about the peer's performance in the video clip

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