

The Pennsylvania State University  
The Graduate School  
College of Education

**TEACHING PRESCHOOL CHILDREN WITH  
AUTISM SPECTRUM DISORDERS  
TO EXPRESSIVELY DISCRIMINATE BETWEEN  
“WHAT’S THAT?” AND “WHERE IS IT?”**

A Dissertation in  
Special Education

by

Cheryl Ostryn

© 2009 Cheryl Ostryn

Submitted in Partial Fulfillment  
of the Requirements  
for the Degree of

Doctor of Philosophy

August 2009

The dissertation of Cheryl Ostryn was reviewed and approved\* by the following:

Pamela S. Wolfe  
Associate Professor of Special Education  
Dissertation Advisor  
Chair of Committee

Frank R. Rusch  
Professor of Special Education

Richard Kubina  
Associate Professor of Special Education

Kathryn Drager  
Department of Communication Sciences and Disorders

Kathy Ruhl  
Head of the Department of Special Education

\*Signatures are on file in the Graduate School

## ABSTRACT

Expressive discrimination of question-asking is a critical conversational skill with significant practical importance for children with ASD to be competent communicators and function in everyday communicative situations. The previous question-asking literature has focused on teaching wh-questions in isolation. This study extended previous research and investigated whether three preschool children with ASD could learn and discriminate between using the wh-questions “*What’s that?*” and “*Where is it?*” Results show that all three children learned to ask the questions and discriminate between them in the appropriate context within 6-16 sessions, and learned novel vocabulary after asking “*What’s that?*” This study supports using a prompting procedure for teaching wh-questions, and the importance of identifying individualized establishing operations to increase attending behavior, as well as detailed pre-requisite skill assessments to maximize learning of wh-questions. Implications and future research are delineated.

## TABLE OF CONTENTS

LIST OF FIGURES.....	vi
ACKNOWLEDGEMENTS.....	vii
CHAPTER 1: Introduction.....	1
Research Questions.....	14
Definition of Terms.....	16
CHAPTER 2: Review of Related Literature.....	18
Communication Competence and Individuals with Autism Spectrum Disorders.....	18
Skinner’s Analysis of Verbal Behavior.....	20
Acquisition of Expressive Wh-questions for Neurotypical Children.....	26
Acquisition of Receptive Wh-questions for Neurotypical Children.....	29
Acquisition of Wh-questions for Individuals with Autism Spectrum Disorders.....	30
Methods for Teaching Wh-questions to Individuals with Autism Spectrum Disorders.....	32
Instruction methods for teaching communication.....	34
Didactic methods.....	34
Naturalistic methods.....	36
Attending Behavior and Teaching Communication.....	40
Joint attention in communication in neurotypical children.....	41
Attending behavior in teaching wh-questions to individuals with autism spectrum disorders.....	41
Attending behavior, joint attention, and communication research in individuals with autism spectrum disorders.....	42
Research on Teaching Expressive Wh-questions to Individuals with Autism Spectrum Disorders.....	44
Highlighted research on teaching wh-questions to individuals with autism spectrum disorders.....	48
Summary.....	53
CHAPTER 3: Method.....	56

Participants and Setting.....	56
Training and Agreement.....	57
Assistant training.....	57
Interobserver agreement .....	58
Treatment fidelity.....	58
Materials.....	58
Independent and Dependent Variables.....	59
Procedure Overview.....	60
Participant Assessments.....	62
Informed consent.....	62
Recruitment of participants.....	62
Preference assessment.....	62
Attending behavior training.....	63
Receptive knowledge assessment.....	64
Pre- and post-knowledge assessment.....	64
Experimental Design and Conditions: .....	65
Phase I: Baseline for discrimination of “what’s that?” and “where is it?” .....	65
Teaching for “what’s that?” and discrimination.....	67
Teaching “where is it?” and discrimination. ....	68
Post-knowledge assessment.....	69
Analysis.....	69
Social Validity.....	69
CHAPTER 4: Results.....	70
Assessments.....	70
Preference assessment.....	70
Attending behavior. ....	70
Receptive knowledge assessment.....	71
Pre- and post-knowledge assessments.....	72
Discrimination.....	73
Reliability. ....	76

Social Validity.....	76
CHAPTER 5: Discussion.....	77
Discrimination Between Wh-Questions.....	78
Acquisition of “What’s that?” and “Where is it?” Questions.....	80
Acquisition of Novel Vocabulary.....	82
Attending Behavior and Establishing Operations.....	83
Implications of Current Study.....	86
Limitations and Future Research.....	88
REFERENCES .....	92
APPENDIX A. Study Procedures.....	117
APPENDIX B. Informed Consent .....	118
APPENDIX C. Participation Eligibility Screeners.....	121
APPENDIX D. Preference Assessment Data Sheet.....	126
APPENDIX E. Attending Behavior Data Sheet.....	127
APPENDIX F. Receptive Knowledge Example and Data Sheet.....	128
APPENDIX G. Pre- and Post-Knowledge Assessment Data Sheet .....	130
APPENDIX H. “What’s that?” Data Sheet.....	131
APPENDIX I. “Where is it?” Data Sheet.....	132
APPENDIX J. Procedural Checklists.....	133
APPENDIX K. Social Validity Questionnaire.....	136
APPENDIX L. Pictures of Items for “What’s that?” (selected).....	137

**LIST OF FIGURES**

FIGURE 1. Percentage of Correct Responses for Discrimination Trials .....	74
FIGURE 2. Percentage of Correct Responses for Teaching and Discriminating “What’s that?” and “Where is it?” Displayed Separately.....	75

## ACKNOWLEDGEMENTS

There are people in this world we are meant to meet, and Dr Pamela Wolfe is one of those people for me. I cannot possibly express my gratitude for all the support you have shown me during my time at Penn State. You have been a mentor of unequal measure, a great listener, supporter, and friend. There has never been an occasion when you have not been there for me, no matter how many times I knocked on your door. I also owe my deepest gratitude to Dr Frank Rusch, who opened the door and let me into his brilliant and creative mind. Talking to you, I believe I was in the presence of genius, although I would never tell you! To Dr Kubina, I would like to thank you for always keeping me on the ABA ‘straight and narrow,’ and being excited about my ideas; you were my greatest reinforcer. To Dr Kathryn Drager, who always threw me a gem of communication brilliance just when I needed it; thank you for being a wonderful resource for all my work.

Furthermore, I wish to thank my wonderful and loving family and friends. My best ‘UK Girls’ Chi-Yen, Katy, and Mel, for their continuous friendship over the years, no matter how many miles I flew. To my sister Nicole for her constant support, to the Montanaros for always being my ‘American family,’ and to Tom Proietti for a certain Italian dinner and an order to undertake my Ph.D. Finally, to my Mom, without whom I would not have got anywhere near where I am today, this dissertation is for you, you are the true power beneath my every step.



## CHAPTER 1

### Introduction

An overarching goal of communication is the effective relaying and receiving of information, needs, or thoughts in a shared medium that has communicative intent to affect the receiver's behavior in some way (Bogdashina, 2005). The ability to communicate is complex and must be functional to achieve the communicator's goal (Light, 1988, 1989, 2003; Ostry, Wolfe, & Rusch, 2008). As noted by researchers, being a competent communicator goes beyond expressing wants and needs, and includes the ability to ask and respond to wh-questions (Light & Binger, 1998; Ostry et al., 2008). Comprehending and answering wh-questions is an important skill in order to become a competent communicator as it helps individuals learn about, and understand their environments. This essential skill gives communicative power to the speaker and supplies a method for obtaining novel information. However, individuals with autism spectrum disorders (ASD) are described as having markedly abnormal or impaired communication skills and thus do not learn the wh-questions through natural exposure as do neurotypical children (NT) (American Psychiatric Association, 1994; Carr, 1982; Jahr, 2001; Lovaas, 1977; New York State Department of Health, 1999; Prelock, 2007; Ritvo & Freeman, 1978; Schopler & Mesibov, 1986a; Schuler, 1980; Scott, Clark, & Brady, 2000; Wertherby, 1986).

Teaching individuals with ASD to ask wh-questions can be challenging. There are many elements to consider when teaching this skill as it is a self-initiated skill requiring comprehension ability of wh-questions and does not result in tangible reinforcement which is typically favored by individuals with ASD. In the current study the discrimination of the wh-questions "*What's that?*" and "*Where is it?*" is examined, but

to understand the complexity of this investigation and how this skill is best taught there are important elements of communication to discuss. First language and communication issues for individuals with autism are explored, as well as the importance of teaching individuals with ASD how to ask wh-questions. Second, discrepancies between the development of wh-questions in NT children and individuals with ASD are discussed. Third, elements of effective instruction and attending behavior when teaching wh-questions to individuals with ASD are described. Finally, a brief review of the wh-question asking literature is presented and discussed in relation to the proposed study.

### *Language and Communication Issues for Children with Autism*

Language and communication impairments are core deficits of individuals with ASD (American Psychiatric Association, 1994; Lovaas, 1977; Scott et al., 2000). These impairments may include issues with volume, pitch, reversal of pronouns, lack of communication initiation, and the unconventional use of speech (idiosyncratic language). Furthermore, approximately 75% of vocal children with ASD display echolalia, or the repeating of a phrase or sound with little or no communicative intent (Baltaxe & Simmons, 1981; Mesibov, Adams, & Klinger, 1997; Scott et al., 2000). Research indicates that without explicit communication instruction approximately 50% of children with ASD will not develop speech and language skills that are deemed functionally adequate to meet their daily communication needs (Lord, Risi, & Pickles, 2004; Peeters & Gillberg, 1999). Therefore, some individuals with ASD may resort to using unconventional means to communicate such as growls, grunts, self-injurious, or inappropriate behavior. Research supports that inappropriate behaviors have functions that may serve communication intent. For instance, a child with ASD who may not be

able to ask “*Where is my dinosaur?*” may resort to banging the table, or other self-injurious behavior until his parents offer him an array of items. He will then stop this inappropriate behavior once he is offered his dinosaur (Carr & Durand, 1985; Jordan & Jones, 1999; Woods & Wetherby, 2003).

#### *Importance of the Wh-questions for Individuals with Autism Spectrum Disorders*

It is important to teach individuals with ASD to ask wh-questions so they have the control over their own communications and are able to appropriately converse with others. Also, individuals with ASD can take an active role in communicating as opposed to a passive role, and have a functional method to initiate communications; a necessity for all individuals.

However, communication is closely intertwined with social skills, another area of difficulty for many children with ASD. According to some researchers, communication may be the most salient predictor of social outcomes and the development of relationships with others (Jordan & Jones, 1999; Woods & Wetherby, 2003). Further it has been suggested that autism is an impairment of communication rather than actual language (Jordan & Jones, 1999; Woods & Wetherby, 2003). Conversational speech and the sharing and giving of information are acts firmly entrenched in social arenas. Individuals with ASD may display impairments that are expressed in many forms including a lack of interest in others and social situations, avoidance and escape behaviors, self-injurious behaviors, inability to read social cues, tantrums, indifference, and awkwardness. As a result, individuals with ASD are unlikely to be socially reinforced by others in their environments, and tend to prefer more tangible

reinforcement (Neisworth & Wolfe, 2005; New York State Department of Health, 1999; Scott et al, 2000).

Due to these communication and social impairments, teaching individuals with ASD to ask wh-questions can be challenging. For example, it is difficult to teach children with ASD to self-initiate communications because they tend to not seek out social interactions, and wh-questions typically are socially-reinforced. Other factors that can be challenging are assessing the function of the question-asking behavior and creating highly motivating environments in which the child with ASD will truly want to know the answer to the question. For instance, if a child is playing with a favorite toy and it is taken away and hidden, the child may then be highly motivated to ask where the toy is located. This behavior can be appropriately reinforced by telling the child the toy's location, after which s/he can mand for the toy. In this situation, it would be inappropriate to give the child the toy directly after the question asking behavior was emitted as the child would be incorrectly reinforced and learn that the "Where?" question was a mand for the toy and not for the location of the toy. Giving the correct answer to a question is a very important distinction when teaching self-initiated wh-questions to children with ASD. It is critical to remember that wh-questions are mands for information, not tangibles, thus making teaching wh-questions a complex task (Cooper, Heron, & Heward, 2007; Skinner, 1957; 1974).

#### *Acquisition of Expressive Wh-questions for Neurotypical Children*

Neurotypical children differ from those with ASD because they typically are socially reinforced when using self-initiated communications. NT children's repertoires consist largely of interrogatives such as "What's that?" and "Where's Mommy?" or

*“Where’s teddy?”* The majority of NT children’s total sentence-communicating ability is to gain and impart information, and the most frequently used questions are *“What?”* and *“Where?”* (Trantham & Pederson, 1976). Parents and caregivers typically incorporate *“What?”* and *“Where?”* when talking to babies as young as six months (Rogow, 1978). The NT child perceives the *“What?”* and *“Where?”* questions in close association to social interactions occurring in the environment. Therefore, the learning of language is bound tightly to environmental experiences (Rogow, 1978). Furthermore, the use of the functional question *“What?”* typically is used by children as early as two years old who are expressing their curiosity about their environment (Koegel & Koegel, 1995; Rogow, 1978; Trantham & Pederson, 1976). Question-asking and answering is a fundamental feature of most instructional and social interactions, regardless of specific content, and much of the informational exchange experienced by NT children occurs in question-answer situations (Paul, 1985; Secan, Egel, & Tilley, 1989).

Researchers have shown that there is a specific order in which NT children learn to ask wh-questions that has remained unchanged over the last 90 years. The order of wh-questions follows the sequence of: (1) What, (2) Where, (3) Who, (4) Why, and (5) When (Bloom, Merkin, & Wootten, 1982; Davis, 1932; Fahey, 1942; Meyer & Shane, 1973; Merkin, Wootten, & Bloom, 1980; Miller, 1981; Smith, 1933; Tyack & Ingram, 1976). One hypothesis offered for the order of wh-questions is that young children typically are attuned with the physical causality and the reality of their present situations more than any other communicative intent such as classification (Meyer & Shane, 1973). (For instance, young children are more likely to ask about items they see, places in which they are present, or the loss of something they want, rather than reasons why something

occurred, which involves cause and effect as a pre-requisite for this question, or when something will occur, in which understanding time is a pre-requisite for this question).

*Methods for Teaching Wh-questions to Individuals with Autism Spectrum Disorders*

Presently, there is no single method for teaching wh-questions to individuals with ASD. However, the most empirically-validated methods for teaching this population are based upon the use of applied behavior analysis (ABA). ABA is the science of behavior in which techniques are applied to the environment in order to improve socially significant behavior, and to demonstrate the variables in the environment that are responsible for the behavior change. Behavior change is achieved by manipulating environmental variables known as antecedents and consequences. There is over 45 years of research demonstrating the benefits of ABA in communication training with individuals with ASD (Cooper et al., 2007; Horner, Carr, Strain, Todd, & Reed, 2002; Kazdin & Weitz, 2003; Koegel & Koegel, 1995; Matson, Sevin, Fridley, & Love, 1990a; Matson, Taras, Sevin, Love, & Fridley, 1990b; Maurice, Green, & Luce, 1996; McConnell, 1967; McEachin, Smith, Groen, & Wynn, 2000; Moore & Bailey, 1973; Risley & Wolf, 1967; Schreibman, 2000; Schreibman & Ingersoll, 2005; Wolf, Risley, & Mees, 1963; Wolfe & Neisworth, 2005).

*Instruction methods for teaching communication.* Two empirically supported communication intervention methods that successfully have been used with young children with ASD age five and under are the didactic (or teacher-directed, TD) and naturalistic methods (Goldstein, 2002; Rogers, 2006; Volkmar, Paul, Klin, & Cohen, 2005). Didactic methods stem from the behaviorist model and involve a high level of teacher control, repetition of trials with practice, and precise identification of antecedents

and consequences (Cipani & Spooner, 1997). There is a plethora of literature to support TD approaches as an effective means of developing attention during instruction, comprehending language, and speech production in young children with ASD. One component of these didactic methods is errorless instruction. Errorless procedures are designed so individuals are always provided with prompts to ensure correct responses. It has been suggested that methods that supply prompts are effective as they prevent the learning and thus practicing of errors, as well as creating a positive learning environment (Kitchen, 2005).

The second empirical method involves naturalistic methods that are more child-directed. Procedures employed in this method include contriving communication opportunities in the child's natural environments and responding to child-initiated communication attempts or interests (Rogers, 2006; McGee, Krantz, Mason, & McClannahan, 1983). The naturalistic approaches documented in the literature have grown out of TD approaches and are well within the framework of ABA. Essentially, the naturalistic method is moderately teacher-directed and developed to increase the generalization outcomes of children which may be lacking in the traditional TD methods (Hart & Risley, 1975; McGee, Morrier, & Daly, 1999).

#### *Importance of Attending Behavior in Teaching Wh-questions to Individuals with Autism Spectrum Disorders*

One important area that is absent from the literature in teaching communication skills to individuals with ASD is that of attending to a task or teaching situation, or *attending behavior*. According to Striefel (1974) in order for a learners to imitate, they need to *attend* to their present situation by (1) staying in the seat, (2) looking at the

teacher/instructor, (3) keeping their hands in their laps so they are focused and not distracted by other items, or using their hands appropriately to partake in the present situation, and (4) looking at items that are being used in the present task (Cooper et al., 2007). Attending behavior is a pre-requisite of joint attention (JA) which is a cluster of behaviors that share a common goal of communicating with another about an event or entity (Bruinsma et al., 2004; Cipani, 2008; Jones & Carr, 2004; Koegel et al., 1998b; Mundy & Crowson, 1997; Rollins et al., 1998). Therefore, in order for individuals with ASD to attain the skill of JA it is imperative that attending behavior be considered when teaching communication skills.

Joint attention in NT children typically occurs by 9-12 months of age but can occur as young as six months; by twelve months most NT children display all acts of JA (Adamson & Bakeman, 1985, 1991; Adamson & Chance, 1998; Brooks & Meltzoff, 2002; Bruner, 1983; Butterworth & Jarrett, 1991; Carpenter, Nagell, & Tomasello, 1998; Morales, Mundy, & Rojas, 1998; Toth, Munson, Meltzoff, & Dawson, 2006). Through JA interactions, children learn to link words and sentences with items and events in the environment, and begins to communicate intent by sounds and gestures, which are then reinforced by parents, siblings, etc. (Baldwin, 1995).

However, because individuals with ASD tend not to be socially reinforced, they typically show impairments in attending skills in comparison to NT children (Bacon et al., 1998; Charman, 1998; Charman, et al., 1998; Dawson, Meltzoff, Osterling, & Rinaldi, 1998; Dawson et al., 2004; Jones & Carr, 2004; Jones et al., 2006; Mundy et al., 1986; Sigman et al., 1992; Wong et al., 2007). Because attending behavior is a pre-requisite of acquisition of later JA skills, is a critical area to address when teaching



communication as these skills have been hypothesized to be pivotal skills for developing language skills. Research suggests that children with ASD are often capable of item-oriented means-ends behavior, but show more difficulty in understanding that other people are intentional agents. Therefore, this difficulty in understanding adds further complexity when teaching the wh-questions, as the other person is very important in this type of communicative exchange (Rollins, Wambacq, Dowell, Matthews, Reese, 1998).

It is well documented in the verbal behavior literature that pairing a person with a highly preferred item will evoke manding. Thus, it is important to create learning situations in which the child has to attend to the other person in order to receive the information. By considering the addition of attending behavior in developing teaching trials, the child's motivation for asking also may increase during wh-question instruction (Dawson, 1988; Koegel & Koegel, 1995; Mundy, 1995; Mundy & Crowson, 1997). For instance, in a recent study centering on teaching the question "*What's that?*" the investigator put an item in a bag and presented it to a young child with ASD. The investigator did not give the child the bag with the unknown (moving/flashing/noisy) item inside, but instead, kept at least one hand on the bag so the child had to engage in a shared attention act with the communication partner as well as ask the question, in order to complete the mand. This, in turn, may have changed the EO from "*I don't have that item and I want to know what it is and maybe have it,*" to "*she has that item and I want to know what it is and maybe have it,*" and thus include the important attending behavior element (Ostryn & Wolfe, under revision; Ostryn, et al., 2008).

*Research on Teaching Expressive Wh-questions to Individuals with Autism Spectrum Disorders*

There is a small empirical research base related to teaching vocal children with ASD to ask wh-questions (Capps et al., 1998). An early study attempted to teach four minimally verbal children with ASD to ask “*What is...for?*” and “*What is/are...doing?*” and investigated generalization and maintenance of their question-asking abilities (Hung, 1977). The results of this study show that participants learned, generalized, and maintained their question-asking only after a token reinforcement system was employed. These results may suggest that incorrect EOs were established. This particular study taught the individuals to use the questions “*What is...for?*” and “*What is/are...doing?*” to *mand for tokens* (Sundberg & Michael, 2001); a very important distinction to acknowledge.

All participants were successful in the acquisition and generalization of the question “*What’s that?*” in another study by Taylor and Harris (1995). These researchers investigated whether three vocal children with ASD could learn and later generalize the question while on a school walk. In 2001, another study using EOs and consequences in teaching question-asking, involved a five-year-old child with ASD to ask “*What is that?*” in the presence of unknown items (Esbenshade & Rosales-Ruiz, 2001). The researchers highlighted the lack of appropriately used EOs and consequences in other published studies and explicitly stated that *the answer* to the question “*What is that?*” was the only consequence given to the participant. This study also examined the use of different stimuli to promote generalization in question-asking. Results showed that the child’s

question-asking generalized for three out of the four conditions (Esbenshade & Rosales-Ruiz, 2001).

In another study, Koegel, Carter, and Koegel (2003) taught children with ASD to self-initiate the questions “*What happened?*” and “*What’s happening?*” by manipulating a pop-up story book. The results indicated that the two children learned and generalized the targeted questions.

Positive results for generalization also were found by Koegel, Camarata, Valdez-Menchaca, and Koegel (1998a) who taught three vocal children with ASD to ask “*What’s that?*” to find out what was inside a bag, and whether EOs used during instruction would result in generalization. Specifically, in order to increase child motivation for question-asking, highly preferred items such as games and edibles were placed in bags and used as reinforcers, as well as other natural reinforcers. The researchers also demonstrated that the results spontaneously generalized to other settings without the presence of the training items or bags. The results show that all three participants consistently and spontaneously asked the target question “*What’s that?*” (Koegel et al, 1998a).

Williams, Donley, and Keller (2000) successfully taught two four year old vocal children with ASD to ask “*What’s that?*” “*Can I see it?*” and “*Can I have it?*” by using a variety of items contained within small boxes. The researchers developed a clear procedure for distinguishing the EOs and consequences of each question. For example, the answer to “*What’s that?*” was the name of the item, whereas the answer given to the child in response to asking “*Can I see it?*” was being shown the item, and in response to “*Can I have it?*” the child was told s/he could have the item, and the item was given. This procedure eliminated any possible confusion for the child that “*What’s that?*” was

to be used for manding for information and not for the item itself. Furthermore, the boxes used varied in shape, size, and texture and the items were described as attractive “(e.g. a sparking spinning wheel, a winding frog that jumped)” in order to motivate the child to ask about the item (Williams et al., 2000, p. 627). The results for all participants were positive and the findings have been replicated with similar positive results (Williams, Perez-Gonzalez, & Vogt, 2003).

A final empirical study investigated contriving EOs for teaching mands for information for “Where?” and “Who?” (Sundberg, Loeb, Hale, & Eigenheer, 2002). This study was developed to investigate the concept that “do the participants in these studies really want to know the answer to their questions, or are other variables controlling their ‘correct’ responses?” (Sundberg et al., 2002, p.16). Researchers used a procedure to contrive the EO for the location of a missing item to evoke “Where?” and, if successful, a further EO was contrived for the question “Who?” The procedure for teaching “Where?” included using two groups of items, one group that had previously been shown to act as reinforcers and the other, neutral items. During baseline, an item (e.g. a frog) was put in a small box and given to the child with the verbal instruction “Get your frog.” The child opened the box and had access to the frog. During the intervention, the child began with free access to the preferred item (e.g. frog) and then it was taken away and a brief distraction was introduced. During the distraction the item was placed in one of two containers by the side of the child. If the child manded “Where... (frog)?” Then s/he was told where it was. If the child did not mand, s/he was prompted for a correct response.

Similar procedures were used to teach the “Who?” question except that the presented containers were empty. Using empty containers was to increase the reinforcing

value of the missing items. Firstly, for both questions, if the reinforcing value of the item was strong, then the absence of it from its usual location will establish that any information regarding the item's location would act as reinforcement. For instance, a child who wants his favorite toy car (EO<sub>1</sub>) that is not in its usual place (EO<sub>2</sub>) may say "Where's my car?" Secondly, the third EO for the "Who?" question occurs when the information after the "Where?" mand establishes additional information as valuable (EO<sub>3</sub>) as in "I gave your car to the teacher." The results of this study are vitally important in helping to understanding the analysis of verbal behavior and serves as a guide for future designs of wh-question studies.

#### *Current Study*

The rationale for the current study was based upon the literature pertaining to typical development, and sought to systematically teach and discriminate between the "What's that?" and "Where is it?" questions parallel to the learning of NT children. Two studies (Ostry & Wolfe, under review; Ostry, in preparation) investigated teaching young preschool children with ASD to ask "What's that?" and "Where is it?" questions separately by creating high EOs and using a prompting procedure. The results indicated that all six participants across the two studies learned to ask and generalize the wh-questions within 1-3 days of training. An obvious next step in the systematic research of wh-questions is the replication of these studies and the combination of the two questions in order to investigate whether individuals with ASD can learn and discriminate between using these questions (Reichle & Sigafos, 1991).

This study was designed to teach the first two wh-questions that NT children develop, and investigate whether children with ASD can decide the appropriate question

to use in discrimination trials. This study represents the first step in teaching and assessing comprehension of the wh-questions and serves as preparation for teaching the third wh-question: “*Who?*” The study is unique in several ways. First, there was extensive screening to assess participants’ abilities for manding, tacting, and comprehension of the “*What?*” “*Where?*” and “*Yes/No*” questions using a series of specifically designed assessments. These assessments served to ensure the eligibility of the participants, their comprehension in understanding the questions they learned, information to establish motivating scenarios, and as a method for obtaining items they desired. Second, participants were to receive attending training if their attending behavior did not meet a preset criterion. Third, participants were to be taught both the “*What’s that?*” and “*Where is it?*” questions in the same study using a prompting procedure. Although these are the first two wh-questions in the typical sequence of wh-question, these questions have never been taught together in a single study. Fourth, there were discrimination trials to measure whether discrimination between “*What’s that?*” and “*Where is it?*” was achieved. This was a unique element as many studies do not assess whether the participant can decide between using the two learned questions, or test whether they can comprehend the meaning of the questions. Fifth, a social validity scale was administered to educators that assessed the ease of effectiveness of the teaching procedure and child outcomes. Specifically, this research addressed the following questions:

1. Can preschool children with Autism Spectrum Disorders discriminate between using “*What’s that?*” and “*Where is it?*” when presented with random discrimination trials?

2. What effect does teaching “*What’s that?*” to preschool children with Autism Spectrum Disorders have on learning novel vocabulary?

### *Definition of Terms*

*“Wh-questions.”* Any question that gives the asker more information about a stimulus. This study focused on two different types of *wh-questions* *“What’s that?”* and *“Where is it?”*

*Function of verbal behavior.* The effect of an utterance on the environment. From a behavioral perspective, this is directly related to the reinforcing contingencies as a result of the utterance. The meaning or intent of verbal behaviors cannot be determined by the form in which it takes, but only by the function and through an application of analysis of the environmental events that have evoked and maintained that behavior (Cooper et al., 2007; Skinner, 1957).

*Attending behavior.* A pre-requisite of joint attention. In order for learners to imitate, they need to *attend* to their present situation by (1) staying in the seat, (2) looking at the teacher/instructor, (3) keeping their hands in their laps so they are focused and not distracted by other items, or using their hands appropriately to partake in the present situation, and (4) looking at items that are being used in the present task (Cooper et al., 2007; Striefel, 1974).

*Mands.* Verbal behavior in which the speaker asks for what s/he needs or wants and which specifies the maintaining reinforcers. Examples of mands are requests, deMands, comMands, and questions. Reinforcers for manding can be tangible or information (Cooper et al., 2007; Skinner, 1957).

*Motivating operations (MO).* Environmental variables that temporarily alter the value of reinforcements or the frequency of behaviors. MOs can increase the value of



reinforcers, known as an Establishing Operation (EO) or decrease the value, known as Abolishing Operation (AO) (Cooper et al., 2007).

*Verbal Behavior.* Any type of responding that is communicative in nature (e.g., speaking, writing, gesturing, or reading) and is not necessarily need to be vocal (Cooper et al., 2007; Skinner, 1957).

*Phase I.* Baseline measurement in which ten trials for asking both “*What’s that?*” and “*Where is it?*” were presented to the participants with no prompts.

*Phase II .* Second phase in which “*What’s that?*” was taught. Each teaching session consisted of 20 trials, followed by a discrimination session identical to baseline.

*Phase III.* Third phase in which “*Where is it?*” was taught. Each teaching session consisted of 20 trials, followed by a discrimination session identical to baseline.

## CHAPTER 2

### Review of the Literature

This chapter presents a review of the literature pertinent to teaching wh-questions to young children with autism spectrum disorders. This chapter is organized into nine parts. The first is an overview of communication competence and communication issues for individuals with ASD. The second is a review of Skinner's analysis of verbal behavior. The third section describes the importance of teaching wh-questions to individuals with ASD, and the fourth and fifth parts describe the acquisition of wh-questions for neurotypical children (NT) and children with ASD respectively. The sixth part of the chapter details the different methods of instruction for teaching communication to individuals with ASD; the seventh describes the importance of attending behavior when teaching wh-questions. The eighth part presents a review of the empirical research on teaching the wh-questions to individuals with ASD, and the final part of the chapter details the importance of the study.

#### *Communication Competence and Individuals with Autism Spectrum Disorders*

An overarching goal of communication is the effective relaying and receiving of information, needs, or thoughts in a shared medium that has communicative intent to affect the receiver's behavior in some way (Bogdashina, 2005). The ability to communicate is complex and must be functional to achieve the communicator's goal (Light, 1988, 1989, 2003; Ostry et al., 2008). Cooley & Roach (1984) use the term "*communication competence*" to describe the goal of communication as possessing the knowledge of what communication patterns are, and how they are used appropriately in specific situations. Light and Binger, (1998) further defined communication competence as the ability of an individual to be sufficiently functional to communicate in daily life

within natural settings, have satisfactory knowledge, judgment, and skill in communicating in order to reach communication goals. As noted by researchers, communication competence goes beyond expressing wants and needs, and encompasses both knowledge and ability (Light & Binger, 1998). Recent researchers have highlighted the usefulness of these communication components due to their application in daily life (Blockberger & Sutton, 2003; Cafiero, 2005; Hoag, Bedrosian, Johnson, & Molineux, 1994; Raghavendra, Bornman, Granlund, & Björck-Åkesson, 2007).

Individuals with ASD are described as having markedly abnormal or impaired communication skills that often prevents them from developing the components necessary for functional communication (Alpert & Rogers-Warren, 1985; American Psychiatric Association, 1994; Carr, 1982; Jahr, 2001; Koegel et al., 1998a; Lovaas, 1977; Neisworth & Wolfe, 2005; New York State Department of Health, 1999; Prelock, 2007; Ritvo & Freeman, 1978; Schopler & Mesibov, 1986a; Schuler, 1980; Scott et al., 2000; Wertherby, 1986). As many as 75% of vocal children with ASD display echolalia, or constant repetition of a phrase or sound, while other speech impairments may include problems with volume, pitch, reversals of pronouns, lack of communication initiation, and the unconventional use of speech (idiosyncratic language) (Baltaxe & Simmons, 1981; Mesibov et al., 1997; Scott et al., 2000). Research indicates that without explicit communication instruction approximately 50% of children with ASD will not develop speech and language skills that are deemed functionally adequate to meet their daily communication needs (Lord et al., 2004; Peeters & Gillberg, 1999). Therefore, some individuals with ASD may resort to using unconventional means to communicate, such as growls, grunts, self-injurious, or inappropriate behavior (Carr & Durand, 1985; Jordan &

Jones, 1999; Woods & Wetherby, 2003). Research supports that these inappropriate behaviors have functions that may serve as communication intent and highlights the importance of teaching individuals with ASD more functional and appropriate communication methods (Carr & Durand, 1985; Jordan & Jones, 1999; Woods & Wetherby, 2003).

Communication is closely intertwined with social skills, which presents another area of difficulty for children with ASD, and therefore may suggest why individuals with ASD display delays in acquiring and appropriately using language. However, communication seems to be the most salient predictor of social outcome and the development of relationships with others. Thus it has been suggested that ASD is more an impairment of communication rather than actual language (Jordan & Jones, 1999; Woods & Wetherby, 2003). Conversational speech and the sharing and giving of information are acts firmly entrenched in social arenas, an area in which individuals with ASD display impairments. The deficits may be expressed in many forms including a lack of interest in others and social situations, avoidance and escape behaviors, self-injurious behaviors, inability to read social cues, tantrums, indifference, and awkwardness (Neisworth & Wolfe, 2005; New York State Department of Health, 1999; Scott et al, 2000). In order to fully understand the function of behaviors in individuals with ASD, it is important to understand the analysis of verbal behavior developed by Skinner (1974) that serves as a framework between communication, behavior, and the motivation to communicate.

#### *Skinner's Analysis of Verbal Behavior*

According to B. F. Skinner, all behavior has a function irrelevant of the topography or form it entails, and all animals display forms of functional

communications. These functional communications include cries, threats, shouts, and warnings that emit a function to another animal such as to warn off a predator, or let another know about their pain. However, it is only the human species that has developed the vocal musculature that has come under operant control, and thus, gave birth to language (Skinner, 1974). Skinner maintained that language and expression were behaviors and therefore subject to the same contingencies that maintain instrumental behavior. Skinner proposed that verbal behavior is the same as any other non-language behavior in that it is acquired, extended, and maintained by the same external variables and principles as other behaviors, such as reinforcement, punishment, and extinction. These principles, among others, control the increase, decrease, and termination of behavior. Skinner explained that verbal behavior is reinforced by the effects on other individuals and therefore it is mediated by another person's behavior. For instance, a verbal response of "*open the window,*" can produce the reinforcing consequence of the window being opened (Cooper et al., 2007; Skinner, 1957, 1974).

Skinner believed that the structural and topographical aspects of language and communication were important, but were secondary to the contingencies that maintained them. His concern lay with the function of the verbal behavior and not the form. Skinner maintained that any response can become verbal when based upon the premise that it is mediated by another (external contingencies) including such behaviors as a baby crying, pointing, gesturing or the clicking of fingers for attention. If these responses are responded to, then they have had an effect on the listener and therefore are verbal behavior communications. All behaviors come under *stimulus control* in which the same verbal behavior is often emitted in the presence of certain stimuli and not others; this

stimuli becomes the *discriminative stimulus* ( $S^D$ ) for that particular behavior to occur. This principle demonstrates how interactions with the environment shape how humans respond to it. The meaning of verbal behaviors cannot be determined by the forms of which they take, but only by the functions and through the application of analyses of the environmental events that have evoked and maintained these behaviors (Skinner, 1957, 1974).

In order to classify the various types of verbal behavior, Skinner identified six verbal operants: (1) mand, (2) tact, (3) echoic, (4) intraverbal, (5) textual, and (6) transcription. The mand is the first operant a child learns and is simply a request for something wanted or needed. For instance, a child may say “*cracker*” because she wants to eat a cracker. A tact is naming or labeling an item (from conTact), such as saying the word “*cat*” because an individual sees a cat, and this operant is under the functional control of a non-verbal  $S^D$  (Cooper et al., 2007; Skinner, 1957; 1974). An echoic is repeating what another person says, such as saying “*cat*” after someone else says “*cat*.” This operant is controlled by a verbal  $S^D$  with point-to-point correspondence and formal similarity. Point-to-point correspondence occurs when the start, middle and end of the stimulus and response are the same, such as one individual saying “*There are four black trucks,*” and a second individual also saying “*There are four black trucks,*” and formal similarity occurs when both the controlling  $S^D$  and the response are produced using the same modality, such as auditory (Cooper et al., 2007; Skinner, 1957; 1974). An intraverbal is answering a question or having a conversation in which the words are controlled by other words, such as saying “*cat*” when someone else says, “*What pet do you have at home?*” (Cooper et al., 2007; Skinner, 1957, 1974). The fifth operant is

textual and this is reading written words such as saying “*cat*” because you see the word *cat* written down (Cooper et al., 2007; Skinner, 1957, 1974). Finally, Skinner’s sixth operant is transcription. Transcription is writing and spelling words that are spoken, such as writing the word *cat* because one hears the word “*cat*” spoken (Cooper et al., 2007; Skinner, 1957, 1974).

Skinner also discussed the important concept of Motivating Operations (MO) in verbal behavior. MOs are environmental variables that temporarily alter the value of reinforcements in specific situations, or alter the frequency of behaviors. MOs can increase the value of reinforcements through deprivation, known as an Establishing Operations (EO), or decrease the value, through satiation, known as Abolishing Operations (AO). Both the EOs and AOs have a motivating effect on the production of particular behaviors. For instance, food deprivation will first make food an effective reinforcer, and second, evoke a behavior that will get the speaker food in the same manner it has got them food in the past, such as saying (manding for) “*cracker.*” Once the speaker has eaten eight crackers, s/he no longer wants anymore due to satiation, and therefore the reinforcing value of crackers has altered and would no longer be an effective reinforcer (Cooper et al., 2007; Skinner, 1957; 1974).

It is important to analyze MOs in relation to wh-questions for individuals with ASD, as these types of questions are mands for information and individuals with ASD are not typically reinforced by information in their social environments. Therefore, when teaching wh-questions one must pay careful consideration to the functions of the question-asking (Sundberg et al., 2002).

Question asking behavior, such as “*What’s inside that box?*” and “*Where is Daddy?*” are mands for information. That is, the speaker wants to know information, and the response to these questions will be supplied by other individuals in the environment, and thus under environmental control (Michael, 1982, 1988, 1993, 2000; Skinner, 1957, 1974; Sundberg et al., 2002). One would assume that if a child asked, “*Where is Daddy?*” that she really wanted to know where he was. However, when teaching individuals with ASD who are not highly reinforced by their environment or social interactions, one must exercise caution in assuming that the individual really does want to know where Daddy is, or if the question-asking behavior is serving a different function. For instance, a NT two-year old may realize daddy has left the room and she cannot see him, and thus the reinforcing value of being near Daddy is high (high EO). When the child asks “*Where’s Daddy?*” and Daddy appears and she runs and gives him a hug, it is apparent that the function of her mand really was to attain Daddy: a tangible reinforcer. When teaching a child with ASD to ask “*Where’s Daddy?*” it is important to assess whether the establishing operation (EO) is relevant (and the child really wants Daddy). According to Sundberg and colleagues, most of the behavioral research in teaching individuals with ASD to ask questions does not identify any establishing operations, or demonstrate that the relevant EO for the particular question is even present (2002). These researchers very importantly state in their own question-asking study, “*do the participants in these studies really want to know the answer to their questions, or are other variables controlling their ‘correct’ responses?*” (Sundberg et al., 2002, p.16).

*Importance of the Wh-questions for Individuals with Autism Spectrum Disorders*



The ability to comprehend and answer wh-questions is an important skill for individuals with ASD to enable them to learn, understand their environments, and have an appropriate and functional method to communicate. Having the ability to ask wh-questions is an essential skill; deficits in this skill severely limit communication because individuals do not have direct control over their own communications. Specifically, being able to ask wh-questions offers individuals communication control in initiating communications and not just in responding. The implications of having the skill of asking wh-questions are far-reaching and may include that: (1) vocabularies will no longer be restricted by what educators and parents teach because individuals will be able to ask for information about novel items, (2) interests will be expanded due to the ability to inquire about activities and request novel information, (3) individuals will have the repertoire to converse with another individual, in typical conversations in which the speakers ask questions, as opposed to simply being able to only answer questions, (which mirrors an interview rather than a conversation), (4) individuals will possess the necessary question asking skills to become competent communicators, (5) individuals will no longer have to wait for information from another person but be able to initiate conversations, and (6) individuals will have the ability to have control over communications and thus may engage in less disruptive behaviors (Carr & Durand, 1985; Koegel et al., 1998c; Light, 1988, 1989, 2003; Light & Binger, 1998; Lord, 1986; Ostry et al., 2008).

Another important reason for wh-questions is that children can learn new vocabulary beyond the words they know for manding and tacting. For instance, a child with ASD who is able to ask “*What’s that?*” with the answer being “*It’s a green, steam engine train which delivers coal to make heat for people’s homes,*” presents the

opportunity to vastly extend vocabulary, and gives the child access to expanded environments in which incidental learning can take place (Esbenshade & Rosales-Ruiz, 2001). Furthermore, researchers Rosales-Ruiz & Baer suggest that question-asking meets the definition of a behavioral cusp or “*a behavior change that has consequences for the organism beyond the change itself, some of which may be considered important,*” (1997, p. 357). Perhaps one of the most important reasons for teaching individuals with ASD to ask wh-questions is simply to allow them a functional way to initiate communications; a necessity for all individuals.

#### *Acquisition of Expressive Wh-questions for Neurotypical Children*

A NT child’s communication is comprised largely of interrogatives such as “*What’s that?*” and “*Where’s Daddy?*” or “*Where’s dolly?*” The most frequently used interrogatives are “*What?*” and “*Where?*” (Trantham & Pederson, 1976). Parents and caregivers typically incorporate “*What?*” and “*Where?*” when talking to babies as young as six months (Rogow, 1978). The NT child perceives the question in close association to what is happening in the social interaction in the environment, and therefore, the learning of language is bound tightly to environmental experiences (Rogow, 1978). The use of the functional question “*What?*” typically is used by children as early as two years who express their curiosity about their environment (Koegel & Koegel, 1995; Rogow, 1978; Trantham & Pederson, 1976), Question-asking is one of the primary self-initiated communications of young children. Initially, children who are 24 months in age will point to an item and utter the word “*Dat?*” or “*Daet?*” in order to find out about the item. This utterance creates an opportunity for the parent/caregiver to respond by labeling the

item and talking about the characteristics (Koegel & Koegel, 1995; Trantham & Pederson, 1976).

Researchers have shown that there is a specific order in which typical children learn to ask wh-questions that has remained unchanged over the last 90 years. The order of wh-questions follows the sequence of: (1) What, (2) Where, (3) Who, (4) Why, and (5) When (Bloom et al., 1982; Davis, 1932; Fahey, 1942; Meyer & Shane, 1973; Merkin et al., 1980; Miller, 1981; Smith, 1933; Tyack & Ingram, 1976). One hypothesis for the order of wh-questions is that young children typically are attuned to physical causality and the reality of their present situations rather than any other communicative intent such as classification (Meyer & Shane, 1973).

A pre-requisite of having the ability to expressively ask wh-questions is the ability to receptively comprehend the meaning of the questions. Specifically, in order to understand wh-questions, one must comprehend the *wh-word* in its semantic relationship to the word it represents (such as the question “*Where?*” denoting a place). It is important that a wh-word signal a question and stand for another word. According to Brown, Cazden, and Bellugi-Klima, the wh-word in a question must be understood to be the point where information is to be put into the sentence and the type of wh-question used indicates the information that is required (1971). In addition the wh-word must be understood as a demand for specific information depending on the type of wh-word used. For instance, one cannot appropriately ask “*What is in the box?*” without understanding the meaning of the referent “*What*” and the relationship with the rest of the sentence, “*...is in the box?*” (Rogow, 1978).

A second important consideration before teaching wh-questions is that an individual may appear to understand a wh-question, but does not fully comprehend it. For instance, if one shows a child a picture of a swing and asks “*What is it?*” the child may give the answer “*swing*” without comprehending the meaning of either “*What*” or “*is this*” Rather, the picture has provided the child with the answer, and the child has merely produced a tact (label) of the item. In this case the child does not need to interpret the question, but recognize only that a question is being asked. This response may then be assumed the question is understood (Rogow, 1978). As suggested by Rogow (1978), a better strategy would be to use the same picture and ask a variety of different questions for which “*swing*” is not the answer, such as (1) Who is on the swing? (2) Where is this? (3) When do you go on this? (4) Who pushes you on this?

Question-asking and answering is a fundamental feature of most instructional and social interactions, regardless of specific content, and much of the informational exchange experienced by NT children occurs in question-answer situations (Paul, 1985; Secan et al., 1989). These exchanges frequently involve the use of questions with the wh-question forms dominating the NT child’s verbal interactions (Nelson, 1973; Parnell & Amerman, 1984). Research indicates that children ask wh-questions only after they have learned to respond to them. Therefore, children are able to receptively respond to the wh-questions before being able to expressively say them (Bloom & Lahey, 1978; Brown, 1968; Hood, 1977; Vicker, 2006). Furthermore, being able to answer particular forms of wh-questions have been suggested as a behavioral requisite for learning to generate one’s own questions of a similar form (Bloom & Lahey, 1978; Brown, 1968).

### *Acquisition of Receptive Wh-questions for Neurotypical Children*

Very young (approx 18 months) non-vocal NT children understand how to respond appropriately to questions. For instance, a child may respond to “*Where is the teddy?*” by pointing or offering the teddy bear to the speaker, thus demonstrating receptive understanding of the question. However, young children remain immature in the ability to say the “*Where?*” question as many young NT children of this age can still only expressively say single communications such as “*dat,*” “*doll,*” or “*mama.*”

As previously mentioned, there is a specific order in which NT children learn to say wh-questions, however this is not the same for learning to comprehend these types of questions receptively. When explicitly teaching children to comprehend the wh-questions, the order begins with *Who* and *What*, as these are thought to be the easiest (Carnine, Silbert, Kame’enui, & Tarver, 2004; Parnell, Patterson, & Harding, 1984). For instance, an example of teaching *Who* would be: “*Amanda went to the library.*” “*Who went to the library?*” “*Amanda.*” “*What did Amanda do?*” “*Went to the library.*” Next, *Where* is taught by introducing a sentence such as “*Andrew played baseball in the park,*” and the child has to answer the following questions: “*Who played baseball?*” “*What did Andrew do?*” and “*Where did Andrew play baseball?*” After *Where* has been mastered, the question *When* is taught by the child hearing a phrase and having to identify if it is *Where* or *When*. For instance, “*In the playground*” (*answer is where*) and “*After breakfast*” (*answer is when*). The final questions in the typical order of acquisition are *How* and *Why*. These are last because they are the hardest to comprehend because events are not represented in the immediate environment and the needed pre-requisite skill of knowing cause-and-effect relationships (Carnine et al., 2004; Parnell et al., 1984). Both

*How* and *Why* questions are taught by the child hearing a phrase and answering a question, such as, “*He ran like a wolf,*” “*How did he run?*” (*answer, like a wolf*), and “*As they were late for football practice, they ran,*” “*Why did they run?*” (*answer, because they were late for football practice*) (Carnine et al., 2004). Although the above questions are examples of methods used in education, yet, it is possible that many NT children may not need to be explicitly taught in this way (Carnine et al., 2004).

#### *Acquisition of Wh-questions for Individuals with Autism Spectrum Disorders*

Unlike NT children, some individuals with ASD do require explicit instruction in how to learn to ask and respond to the wh-questions (Carnine et al., 2004). Research indicates that approximately 50% of children with ASD do not develop functional speech and require explicit training (Lord et al., 2004; Peeters & Gillberg, 1999). One of the most prominent characteristics of individuals with ASD is a marked delay in the ability to produce language, including asking the wh-questions, lack of knowledge related to how to use various forms of expressive language, and partaking in social interchanges with others (Curcio & Paccia, 1987). Furthermore, speakers typically are required to simplify verbal initiations from wh-questions that require answers to more simplified yes/no questions for individuals with ASD (Curcio & Paccia, 1987).

Only a few studies have investigated question-answering behavior in children with ASD (Jahr, 2001; Krantz, Zalski, Hall, Fenske, & McClannahan, 1981; Secan et al., 1989). The limited research suggests that *language delayed* children follow the same sequence in responding to wh-questions as NT children, but progress at a slower rate (Lee & Ashmore, 1983). In a study of individuals (aged 3-20 years) with specific language impairment, mild and moderate cognitive disability, and ASD, the researchers

focused on whether individuals with ASD demonstrated comprehension difficulties in mastering wh-questions in comparison to NT children (Vicker, 2006). The results from the study add support that the order of comprehension of wh-questions mirrors that of NT children. The results also showed that the error patterns for the individuals with ASD were similar to those with cognitive impairment, but dissimilar to all other groups. These errors included mismatches between the type of wh-question asked, as “*Who cooks dinner?*” (requiring a *who / person-based response*) but responding with an incorrect form, “*In the kitchen*” (*response is where or location based*). Other errors given by the participants were no responses, gestured responses, or extraneous remarks to the question (Vicker, 2006). Interestingly, the errors made by the participants were not age-specific; younger children with ASD did not automatically produce more errors than the older children which may give cause to analyze the verbal behavior of the participants.

However, it could be suggested that some children did not understand what they were being asked to do as they had not learned the skill to mastery. Another plausible explanation could be found in the analysis of the verbal behavior produced by the children. Specifically, it is not stated in the study that EOs were identified for the children, when required to answer questions such as “*Who washed your dirty clothes?*” “*Where do you sleep?*” and “*Where is the milk kept?*” among others (Vicker, 2006, p. 17). These questions were selected because they were common questions the children could answer. As noted by Sundberg and colleagues (2002) it is not known the children’s motivations for answering the questions. Perhaps they did not respond as a function to escape the task, or gave the wrong response because they were un-motivated to answer

such questions. Another factor affecting the results may be related to the lack of child-related reinforcers.

The study reviewed above was not designed to investigate the teaching of wh-questions to individuals with ASD, rather to assess the receptive communication abilities of children with ASD at certain stages. There are a few published studies that directly investigate teaching children with ASD to answer wh-questions. Specifically, two studies used visual cues to facilitate question-answering (Krantz et al., 1981; Secan et al., 1989). Both studies investigated the effects of a training strategy that used modeling and reinforcement procedures to teach responses to “*What?*” “*How?*” and “*Why?*” questions using magazine pictures as referents. Results from both studies showed that the procedure was effective in teaching a generalized response when the visual cues were visible. However, Secan and colleagues also found that further training was required for responses to generalize to other settings when the cues were not visible (1989). In 2001, a study designed to extend this work investigated the teaching, transfer, and maintenance of wh-question answering with individuals with ASD without the use of visual cues (Jahr, 2001). The results were very positive and showed that all five participants were able to learn and generalize their answers across persons, settings, and time (Jahr, 2001).

#### *Methods for Teaching Wh-questions to Individuals with Autism Spectrum Disorders*

Presently, there is no single method identified as successful for teaching wh-questions to individuals with ASD. However, the most empirically-validated methods for teaching this population are based upon the use of applied behavior analysis (ABA), the only treatment currently recommended by the Surgeon General (Public Health Service). ABA is the science of behavior from which the principles are applied to improve socially



significant behavior and to identify the variables in the environment that are responsible for the said behavior change. Behavior change is achieved by studying and manipulating environmental variables known as antecedents and consequences (Cooper et al., 2007). Programs based on ABA make use of a multitude of principles that aim to manipulate environmental variables in order to change behavior for socially significant reasons (Cooper et al., 2007; Ferster & DeMyer, 1961; Matson & Smith, 2008).

Some of these ABA principles include differential reinforcement (reinforcing the correct responses and not reinforcing the incorrect responses), extinction (terminating a previously reinforced behavior), and teaching alternative behaviors (not attending to a child screaming for a train, but instead attending to the spoken or signed mand “*train*”). ABA programs are designed for individuals with ASD to help them live socially beneficial lives. It can readily be argued that in order for individuals with ASD to have socially meaningful lives, they need to be able to have the skills to engage in a basic conversational exchange (Gallagher & Darnton, 1978; Lovaas, 1977; Twardosz & Baer, 1973; Wilcox & Leonard, 1978). Engaging in conversation is important because the dialogue between humans constitutes a major element in daily life, and it is important to explicitly teach individuals with ASD how to ask wh-questions so they can meaningfully participate in life (Brown, 1968; Vicker, 2006; Zambolin, Fabrizio, & Isley, 2004).

There is a plethora of research related to the use of ABA and Verbal Behavior (VB) with children with ASD. Over 45 years of empirically-based literature has demonstrated that ABA is beneficial in the treatment of children with ASD for a variety of different behavioral problems including communication, joint attention skills, generalization, tantrums, toilet training, stealing, and self-help skills, among others

(Bregman, Zager, & Gerdtz, 2005; Cooper et al., 2007; Horner et al., 2002; Kazdin & Weitz, 2003; Koegel & Koegel, 1995; Lovaas, 1987; Lovaas, Schaeffer, & Simmons, 1965; Love, Matson, & West, 1990; Marshall, 1966; Marshall & Hegrenes, 1970; Matson, Benavidez, Compton, & Paclawskyj, & Baglio, 1996; Matson et al., 1990a; Matson et al., 1990b; Maurice et al., 1996; McConnell, 1967; McEachin et al., 2000; Moore & Bailey, 1973; Risley & Wolf, 1967; Schreibman, 2000; Schreibman & Ingersoll, 2005; Wolf et al., 1963; Wolfe & Neisworth, 2005).

*Instruction methods for teaching communication.* Two empirically supported communication intervention methods that have successfully taught young children with ASD age five and under have been identified as didactic and naturalistic (Goldstein, 2002; Rogers, 2006; Volkmar et al., 2005). These two methods share common elements as they are based on the behaviorist model, but also include unique variations in teaching communication to young children.

*Didactic methods.* Didactic methods for communication training stem from the behaviorist model and are based on the principles of mass trials, operant conditioning, shaping, prompting, and chaining. The principles of reinforcement and punishment are used to increase desired behaviors and decrease unwanted behaviors (Cipani & Spooner, 1997). Didactic teaching methods involve a high level of adult control, repetition of trials with practice, and precise identification of antecedents and consequences. Due to the adult-directed nature of these methods, they are also referred to as teacher directed (TD). There is ample literature to support TD approaches as an effective means of developing attention during instruction, comprehending language, and speech production in young children with ASD. The most basic method within this approach is termed discrete trial

instruction (DTI), and involves breaking a target skill into smaller components and using highly structured drill-like sessions, to teach each component until mastery (Hewett, 1965; Jensen & Sinclair, 2002; Lovaas, 1987; Wolf et al., 1963). A discrete trial involves four parts, (1) instruction or cues to tell the child what is expected, (2) prompting to support the child's correct response (which is faded over time), (3) a response, and (4) appropriate and individualized reinforcement for the child's correct responses (Goldstein, 2002; Knapczyk & Livingston, 1974; Rogers, 2006).

The large literature base supporting the method of TD approaches in communication has been studied in both group design and single subject studies and has demonstrated efficacy in teaching preverbal children with ASD to learn language (Goldstein, 2002; Rogers, 2006). For instance, some of the TD studies include eliciting vocal imitation (Ross & Greer, 2003), teaching speech to non-verbal children (Wolf et al., 1963), eliciting first words using Rapid Motor Imitation (RMI) (Tsiouri & Greer; 2003), teaching complex sentences (Krantz et al., 1981), use of questions (Williams et al., 2003), developing first words, (Yoder & Layton, 1988) All examples noted above extend the earlier work of Hewett (1965), and Lovaas (1977, 1987).

One form of the TD approach is errorless instruction. Errorless instruction procedures are designed so individuals are always provided with prompts to ensure correct responses are given. This form of instruction has been adapted in order to teach the wh-questions, by using a verbal prompting instruction procedure. This procedure is similar to errorless instruction as it does not allow the individuals to produce the incorrect answer, but always supplies next prompt needed to give the correct response. The verbal prompting method specifies that if an incorrect answer or no answer is given by the

participant, a prompting hierarchy is used. The hierarchy is a systematic prompting procedure that typically includes verbal prompts, modeling, and sometimes physical prompts. For instance, if a child does not give an answer, then a first verbal prompt is given. If there is still no correct response from the participant, then a second verbal prompt is given, and so on until four verbal prompts have been given. After the fourth prompt, (a model and/or) a physical point to the item is prompted along with a fifth verbal prompt. It has been suggested that these errorless methods of teaching are more reinforcing for individuals because they always get the response correct. Also this method does not permit individuals to learn and subsequently practice errors. Using this form of instruction also maintains a positive learning environment in which individuals are consistently exposed to correct responses (Kitchen, 2005).

*Naturalistic methods.* A second empirically based communication method to intervention for young children with ASD are naturalistic methods. This approach applies operant principles to functional communicative situations and centers on providing instruction after a child has initiated a communication attempt, rather than before (Hart & Risley, 1968). For example, after an initiation, a child is given access to what s/he is interested in contingent on eliciting the appropriate communication required (Hart & Risley, 1968). Researchers (Rogers, 2006; McGee et al., 1983) list the key features of the naturalistic approach as (1) the instructor contrives/plants items in the environment to initiate the child's behavior, (2) instruction occurs in the natural environment, (3) items used are of high preference to the child, (4) the child seeks stimuli from a range provided by the instructor, and (5) the child receives reinforcement from the instructor dependent on the initiating behavior.

The naturalistic methods documented in the literature have grown out of TD approaches and are grounded within the framework of ABA. Essentially, naturalistic methods are moderately teacher-directed and developed to increase generalization outcomes of children which may be lacking in the traditional TD methods due to contrived situations/settings (Hart & Risley, 1975; McGee et al., 1999). Naturalistic methods are well documented in the literature for initiating speech in non-vocal children (Koegel, O'Dell, & Koegel, 1987), increasing the complexity of language (Laski, Charlop, & Schreibman, 1988), and improving pragmatic aspects of language (Charlop & Trasowech, 1991).

Examples of naturalistic teaching methods include (1) *Milieu teaching*; an overarching term that refers to methods taught in the child's natural environment (Goldstein, 2002), and (2) *Prompts for Restructuring Oral Muscular Phonetic Targets (PROMPT)* system, based on the theory that a main challenge in ASD is apraxia or a deficit of motor movements in speech (Hayden-Chumpelik, 1984, 2006; Square-Storer & Chumpelik Hayden, 1989). Milieu teaching methods have shown efficacy in the early language development of individuals with ASD (Kaiser, Yoder, & Keetz, 1992; McGee et al., 1999), and the approaches are adaptations of teacher-directed procedures (Paul & Sutherland, 2005). These adaptations include training in the natural environment, interspersing activities throughout the day as opposed to at a specific therapy time, using preferred activities so child participation is self-reinforcing, limiting prompts and replacing these with appropriate facial expressions, and child-initiated activities (Rogers, 2006).

Three types of Milieu teaching methods for communication include a prompt-free procedure (Mirenda & Santogrossi, 1985), mand-model approach (Rogers-Warren, & Warren, 1980), and incidental teaching (Hart & Risley, 1975). The strengths of these approaches are an increased opportunity for learning in the natural environment, learning about natural contingencies, and being naturally reinforced by variables in the environment (Delprato, 2001). The Milieu teaching approach has shown increased communication initiation in children with ASD who did not previously display this skill (Matson, Sevin, Box, Francis, & Sevin, 1993), the development of speech (Koegel, Koegel, & Surratt, 1992), and increase in speech frequency and elaboration (Delprato, 2001; Goldstein, 2002; Koegel, 2000).

A second naturalistic approach to communication training is the PROMPT system that addresses the motor movements required for speech production (Hayden-Chumpelik, 1984, 2006). Some researchers advocate that apraxia is a major problem in children with ASD and believe that an approach that focuses on this disorder will be of value to these children (Gernsbacher, 2002; Rogers, 2006). The PROMPT method involves tactile stimulation to produce the correct sounds. Currently there has only been one empirical study published with positive results. However, this study did not focus on young children with ASD (Freed, Marshall, & Frazier, 1997).

A more holistic form of naturalistic teaching is the Natural Language Paradigm (NLP), that focuses on a more comprehensive approach to the child's early intervention rather than just teaching individual activities (Koegel, Koegel, & Carter, 1998b; Koegel et al., 1987; Rogers, 2006). This approach involves the child selecting stimuli with which to engage; activities for which these items are used are changed regularly from stimuli to

reinforcers, and a wide variety of language is modeled throughout these activities. Targeted and mastered skills are interchanged throughout teaching and the program remains highly child-focused (Laski et al., 1988; Rogers, 2006).

A final naturalistic method is Pivotal Response training (PVT), in which a small set of important pivotal skills are taught that will lead to more general increases in communicative behavior (Koegel et al., 2003; Koegel et al., 1998b). An important consideration when using this method is to select the correct behaviors to teach that will increase non-trained behaviors. Among the pivotal communication behaviors described by Koegel, Koegel, Harrower, & Carter, is the initiation of communication that is a pivotal behavior leading to increased opportunities for spontaneous social learning and increased social competence (1999). This initiation behavior is achieved by providing motivation to initiate communication and using prompting and shaping techniques borrowed from ABA principles. Question asking is executed by placing a child-preferred item in an opaque bag and prompting the child to ask “*What’s that?*” (Koegel et al., 1999).

Other naturalistic teaching methods for teaching communication to children with ASD includes TEACCH (Schopler & Mesibov, 1986b; Schopler & Olley, 1982), the Douglass Developmental Disabilities Center Program (Harris, Handleman, Arnold, & Gordon, 2000), the Learning Experience and Alternative Program (LEAP) (Strain & Hoyson, 2000), the UCLA Young Autism Project (Smith, Donahue, & Davis, 2000), and the Denver Model (Rogers, Hall, Osaki, Reaven, & Herbison, 2000). A central feature of all these naturalistic methods is that there is a greater emphasis on teaching in the child’s natural environment, thereby increasing generalization opportunities. However, this

strength is a weakness. As the naturalistic method has less structure than the TD method there is greater responsibility on the instructor to make moment-to-moment decisions because the natural environment is not easily controlled. Training in the natural environment means that instructors require significant training and must demonstrate fluency in the principles and procedures, and thus rely heavily on clinical skills. Furthermore, due to the need for extensive technological and applicable knowledge, this approach is more difficult to teach to parents and peers, and to replicate (Rogers, 2006).

As children with ASD do not naturally learn through exposure as NT children, and do not naturally generalize their learned skills to untrained settings, these individuals need to be explicitly taught communication skills, and given opportunities for practice in natural environments (Stokes & Baer, 1977). Following is a review of research detailing teaching wh-questions to individuals with ASD. The research incorporates use of both teacher-directed and some naturalistic methods used to teach individuals with ASD. The use of these methods described in the literature is not surprising as these techniques are based on solid scientific research such as ABA and demonstrate a long history of efficacy in teaching communication to individuals with ASD (Cooper et al., 2007). However, before reviewing the research literature, information about attending behavior is presented. Attending behavior has shown to be a pre-requisite skill for joint attention, which is an important component when teaching communication to children with ASD (Striefel, 1974).

#### *Attending Behavior and Teaching Communication*

One important area that is absent from the literature in teaching communication to individuals with ASD is attending to a present task or teaching situation. According to



Striefel (1974) in order for a learners to imitate, they needs to *attend* to their present situation by (1) staying in the seat, (2) looking at the teacher/instructor, (3) keeping their hands in their laps so they are focused and not distracted by other items, or using their hands appropriately to partake in the present situation, and (4) looking at items that are being used in the present task (Cooper et al., 2007). Attending behavior is a pre-requisite of joint attention (JA) which is a cluster of behaviors that share a common goal of communicating with another person about an event or entity (Bruinsma et al., 2004; Cipani, 2008; Jones & Carr, 2004; Koegel et al., 1998b; Mundy & Crowson, 1997; Rollins et al., 1998). In order for individuals with ASD to attain adequate JA it is necessary to examine attending when teaching communication.

*Joint attention in communication in neurotypical children.* Joint attention in NT children typically occurs by 9-12 months of age, but can occur as young as six months, and by twelve months most NT children display all acts of joint attention such as alternating eye gaze between people and items, following eye gaze or pointing, and directing the attention of another (Adamson & Bakeman, 1985, 1991; Adamson & Chance, 1998; Brooks & Meltzoff, 2002; Bruner, 1983; Butterworth & Jarrett, 1991; Carpenter et al., 1998; Morales, Mundy, & Rojas, 1998; Toth et al., 2006). Through these JA interactions, the child learns to link words and sentences with items and events in the environment, and begins to communicate intent by sounds and gestures which are then reinforced by a parent, sibling, etc. (Baldwin, 1995).

*Attending behavior in teaching wh-questions to individuals with autism spectrum disorders.* As individuals with ASD tend not to be socially reinforced, they typically have impairments in attending skills in comparison to NT children. This deficit in attending

behavior may be because the behavior requires social motivation (Bacon et al., 1998; Charman, 1998; Charman, et al., 1998; Dawson, Meltzoff, Osterling, & Rinaldi, 1998; Dawson et al., 2004; Jones & Carr, 2004; Jones et al., 2006; Mundy et al., 1986; Sigman et al., 1992; Wong et al., 2007). As attending behavior is a pre-requisite of later joint attention skills, is a critical area to address, as these skills have been hypothesized as being pivotal skills by demonstrating positive effects on developing language skills. In addition, early functional language ability has been associated with later academic and social achievement in individuals with ASD (Jones & Carr, 2004; Howlin et al., 2000; Moore & Dunham, 1995; Mundy & Crowson, 1997; Schreidman et al., 1996; Sigman & Ruskin, 1999; Whalen et al., 2006; Venter et al., 1992). Furthermore, in preschool children with ASD, JA skills have shown to be predictive of both current language ability, and future expressive language skills (Bono, Daley, & Sigman, 2003; Charman et al., 2003; Dawson et al., 2004; Landry & Loveland, 1988; Mundy et al., 1990; Mundy, Sigman, Unmgerer, & Sherman, 1987; Rogers & Hepburn, 2003; Sigman & Ruskin, 1999; Toth, Dawson, Munson, Estes, & Abbott, 2003).

*Attending behavior, joint attention, and communication research for individuals with autism spectrum disorders.* Research on nonverbal social-communication skill development suggests that young children with ASD have the most difficulty in developing non-verbal attention skills, moderate difficulty in the development of social turn-taking skills, and the least difficulty with non-verbal requesting skills (Adamson & McArthur, 1995; Baron-Cohen, 1989; Curcio, 1978; Dilavore & Lord, 1995; Doehring, Benaroya, Klaiman, & Scuccimarri, 1995; Loveland & Landry, 1986; McEvoy, Rogers, & Pennington, 1993; Mundy & Sigman, 1989a; Mundy & Sigman, 1989b; Mundy,

Sigman, & Kasari, 1990; Mundy et al., 1986; Stone, Ousley, Yoder, Hogan, & Hepburn, 1997; Wetherby, Yonclas, & Bryan, 1989). Children with ASD often are capable of item-oriented means-ends behavior, but show more difficulty in understanding that other people are intentional agents, thus resulting in challenges when teaching the wh-questions (Rollins et al., 1998).

In one intervention study that investigated JA skills in young children with ASD, the intervention group showed greater gains in language twelve months post-study compared to the control group (Kasari, Freeman, & Paparella, 2004). Another study found an association between the development of communicative acts used to establish and maintain shared attention and the development of vocabulary (Rollins, Bay, & Aires, 1996). Furthermore, the frequency of communicative acts used to establish and maintain JA was found to be an excellent predictor of how fast high-functioning children with ASD acquired new language abilities (Rollins, 1994; Rollins & Snow, 1998). These findings have important educational and clinical implications for teaching the wh-questions to individuals with ASD. It is important to engage the child in activities that facilitate JA, although this is very difficult with members of this population as it is documented that the JA development is severely truncated in practically all children with ASD (Baron-Cohen, 1989; Wetherby et al., 1989).

It is also possible that JA may be useful in complementing the EOs during wh-question instruction. It has been thoroughly discussed in this review that motivation is a crucial component in verbal behavior, and it is possible that JA can be manipulated in order to increase a child's motivation (Dawson, 1988; Koegel & Koegel, 1995; Mundy, 1995; Mundy & Crowson, 1997). For instance, in a recent study of teaching the question

“*What’s that?*” to young children with ASD, the investigator did not give the child the bag with the unknown (moving/flashing/noisy) item inside, but instead, kept at least one hand on the bag so the child had to engage in a shared attention act with the person as well as ask the question, in order to complete the mand. This in turn may have changed the EO from “*I don’t have that item and I want to know what it is and maybe have it,*” to “*she has that item and I want to know what it is and maybe have it,*” to include the important attending behavior element (Ben-Arieh, 2007; Ostry, in preparation).

*Research on Teaching Expressive Wh-questions to Individuals with Autism Spectrum Disorders*

There is a small empirical research base related to teaching vocal children with ASD to ask wh-questions (Capps et al., 1998). Specifically, an early study sought to teach four minimally verbal children with ASD to ask “*What is...for?*” and “*What is/are...doing?*” during a summer camp (Hung, 1977). The second part of the study then examined the variables controlling the generalization of these two question-asking behaviors across settings, response classes, and time. The results of this study show that the participants learned to ask the questions when a token reinforcement system was employed, but there was minimal generalization beyond the training setting until the same reinforcement system again was used. Follow-up data showed that three participants maintained their correct question-asking only under the contingencies of the reinforcement system, and did not spontaneously ask the questions in the absence of the system. This is a major concern of this study. No EOs were established for the individuals so they had no motivation to ask the questions. Once they were given reinforcement their responses increased. However, it is plausible to suggest that they

were simply manding for the token, without actually wanting to know the answer to the questions they were asking. This also may explain why the participants did not generalize the questions and why, using a follow-up test, the participants only returned to asking the questions when their responses were under stimulus control with a token reinforcement system.

These ideas are in direct opposition to an important verbal behavior principle noted previously that it is vital that the primary source of control is the EO and not the S<sup>D</sup> when teaching a child with ASD to ask a question. It is also important that the relevant consequences are delivered as verbal responses and not as praise, counters, tokens, or other tangible reinforcers. Specifically, the result of using tangible reinforcers during teaching may produce what appears to be a correct response, but the response may be given for the wrong reasons; the response is correct in form but incorrect in function (Sundberg & Michael, 2001).

In another study by Taylor and Harris (1995) all participants were successful in the acquisition of the question “*What’s that?*” These researchers investigated whether three vocal children with ASD could learn and later generalize “*What’s that?*” on a school walk, and also learn novel information given to them after they asked the question. The dependent variable was the number of times the child said “*What’s that?*” while pointing to the unknown stimulus during training and on the school walk, and how many items were identified in a pre- and post-test. Results showed that participant one (baseline, 0%) met the 80% criteria within seven sessions and maintained a mean of 96% correct responses during the next 24 sessions. Participant two (baseline, 0%) met the 80% criteria within five sessions and maintained a mean of 98% during the next 17 sessions,

and participant three (baseline, 2 correct out of 16 trials) met the 80% criteria within four sessions and maintained a mean of 99% correct responses during the next 15 sessions.

In order to measure whether the participants had acquired any novel information they were tested both receptively and expressively. Specifically, the participant was required to point to the correct picture or tact the item. For participant one (receptive mean baseline 15% correct and expressive baseline 0% correct) the performance was 82% (mean) for the receptive test, and 33% (mean) for the expressive test. For participant two (receptive mean baseline 20% correct and expressive baseline 0% correct) the performance was 88% (mean) for the receptive test, and 43% (mean) for the expressive test. Finally, for participant three (receptive mean baseline 15% correct and expressive mean baseline 2% correct) the performance was 73% (mean) for the receptive test, and 78% (mean) for the expressive test.

The final research question in the study by Taylor & Harris (1995) was whether the participants were able to generalize the “*What’s that?*” question and generalize the response in a less structured environment, such as a school walk. Taylor and Harris used a naturalistic method as the experimenter planted items in the environment to initiate the child’s behavior, such as “*a gum ball machine might have been placed in the bathroom,*” (1995, p. 11). The instruction also occurred in the natural environment. The participant received reinforcement from the instructor dependent on the initiating behavior (Rogers, 2006). For participant one and two, mean baselines for asking the question were 5% and 26% respectively; these increased during instruction to 98% and 100% respectively. The third participant’s mean baseline ranged between 80%-100% and during instruction was 99%. The third participant’s baseline was much higher and may lend evidence of

successful generalization from teaching to the untrained setting. This study is one of the most detailed and well controlled studies in the current question-asking literature.

Another study that used establishing operations and consequences was one conducted by Esbenschade & Rosales-Ruiz (2001) in which taught question-asking to a five-year-old with ASD in the presence of unknown items. The researchers highlighted the lack of appropriately used EOs and consequences in other published studies, and explicitly stated that *the answer* to the question “*What is this?*” was the only consequence given to the participant. This study also examined the use of different stimuli to promote generalization in question-asking. Results showed that the child’s question-asking generalized to three conditions; “*Tell me what you see on the table,*” “*Pick one,*” and “*Look*” (p.208), but did not generalize for the task that required the child to do something with item, such as, “*Put this on the table,*” and “*Give this to...*” (p.208). In addition to question-asking, the child also learned the names of some of the novel items, a finding replicated in other research, and indeed, is a desired outcome for individuals with ASD.

A different wh-question asking study taught children with ASD to self-initiate the questions “*What happened?*” and “*What’s happening?*” (Koegel et al., 2003). In this study, the wh-questions were taught by manipulating a pop-up story book of child desired themes and prompting the child to ask about the story (Koegel et al., 2003). The researchers contribute the efficiency of acquisition (8 sessions for both children) to the child-desired themes that were highly motivating. This study may again highlight the importance of using EOs. In this study it was likely that the child really did want to know about the story as they had chosen it (Koegel & Mentis, 1985). The results showed that

the two children learned to ask the wh-questions, and there was generalized use of the initiation into other question forms, and related increases in mean length of utterances, verb acquisition, and diversity. The authors suggest that one of the important findings of the study was the generalization outcomes of the two children, as previously noted generalization is an area of concern for individuals with ASD.

*Highlighted research on teaching wh-questions to individuals with autism spectrum disorders.* Positive results for generalization were found in a study in which three vocal children with ASD were taught to ask “*What’s that?*” to find out what was inside a bag. This study also examined whether motivational procedures used during teaching would result in generalization of skills (Koegel et al., 1998a). In order to increase child motivation for question-asking, highly preferred items such as games and edibles were placed in bags as reinforcers; natural reinforcers were also used. These highly preferred items and inside the opaque bags were systematically faded until the participants were asking about neutral (non-preferred) items that were placed on the table. The researchers also demonstrated that the results spontaneously generalized to other settings without the presence of the training items or the same bag. In this study, the dependent variable was each child’s spontaneous utterance of the target question, during baseline, training, and generalization, and a pre-post test of the labeling of the items that were presented. The results show that all three participants consistently and spontaneously asked the target question “*What’s that?*” although there was a slight decrease as the items were faded from highly preferred to neutral (which may be naturally occurring in all children as the EO decreases).



The second important finding of Koegel and colleagues' study was that the children continued to ask the "*What's that?*" question in new settings, with new people, and new stimuli several weeks after the study was completed. This finding offers evidence that spontaneous generalized question-asking can be achieved. Generalized and spontaneous responses may have occurred because the variables used during the treatment were known to increase motivation (such as initially using the highly preferred items that the children wanted). These items were slowly faded and the children began to spontaneously ask about unfamiliar items. It is suggested by the authors that the question-asking resulted in gaining information becoming reinforcing in itself, even though information is typically not reinforcing for individuals with ASD. However, it also is possible that the discontinuation of the bag and the use of neutral items may be an increase in stimulus generalization (but it just may not appear so because of the systematic fading that occurred). Furthermore, the "*What's that?*" question is a relatively low-demand question, because it is visually prompted by the item being inquired about, and this may also explain the positive outcomes of this study (Koegel et al., 1998a).

Williams and colleagues (2000) successfully taught two four-year old vocal children with ASD to ask "*What's that?*" "*Can I see it?*" and "*Can I have it?*" by using a variety of items contained within small boxes. The researchers developed a clear procedure for distinguishing the motivation and consequences of each question. For example, the answer to "*What's that?*" was the name of the item, whereas the answer given to the child in response to asking "*Can I see it?*" was being shown the item. In response to "*Can I have it?*" the child was told s/he could have it, and the item was given. This procedure eliminated any possible confusion for the child that "*What's*

*that?*” was manding for information and not for the item itself. Furthermore, the boxes varied in shape, size, and texture, and the items were described as attractive, e.g., “*a sparking spinning wheel, a winding frog that jumped*” in order to present an EO for the child; deprivation of the unknown and attractive item (Williams et al., 2000, p. 627). The dependent variable was the frequency of each child’s wh-questions during a ten-minute session. The results for both participants for asking “*What’s that?*” question increased from zero in baseline to means of 8.2 and 22 per session. Furthermore these rates were maintained during generalization sessions, which occurred after every session, and follow-up. This study was replicated and extended with similar positive results. Specifically, three males with ASD also responded independently to the three wh-questions. These findings lend support for the procedure used to teach children with ASD to ask questions (Williams et al., 2003).

A well-controlled empirical study investigated contriving establishing operations for teaching mands for information teaching “*Where?*” and “*Who?*” (Sundberg et al., 2002). This study was developed to investigate the concept that “*do the participants in these studies really want to know the answer to their questions, or are other variables controlling their ‘correct’ responses?*” (Sundberg et al., 2002, p.16). Researchers used a procedure to contrive the EO for the location of a missing item to evoke “*Where?*” and, if successful, a further EO would be contrived for the question “*Who?*” The procedure for teaching “*Where?*” included using two groups of items, one that had previously been shown to act as reinforcers and the other, neutral items. During baseline, an item (e.g. a frog) was put in a small box and given to the child with the verbal instruction “*Get your frog.*” The child opened the box and had access to the frog. During the intervention, the

child began with free access to the preferred item (e.g. frog) and then it was taken away and a brief distraction was introduced. During the distraction the item was placed in one of two containers by the side of the child. If the child manded “*Where... (frog)?*” Then s/he was told where it was. If the child did not mand, he was prompted for a correct response.

Teaching the “*Who?*” question was a similar procedure for baseline, but during the intervention the presented containers were empty. Unsurprisingly, both children manded “*Where?*” and the researcher responded by saying “*I gave it to the teacher*” (Sundberg et al., 2002, p.24). The children’s next responses were recorded for baseline. During intervention, the same procedure was employed but after the investigator said “*I gave it to the teacher,*” the child was then prompted to say “*Who has it?*” (Sundberg et al., 2002, p.24). After a correct echoic response the child was told the teacher’s name. The results of this study show that the children acquired these wh-questions/mands when the relevant EOs were manipulated as independent variables that made the information to retrieve the wanted items valuable. The researchers discuss that for the mand “*Where?*” there were two EOs, and for the mand “*Who?*” there were three. Firstly, for both questions, if the reinforcing value of the item was strong, then the absence of it from its usual location would establish that any information regarding the item’s location will act as reinforcement. For instance, a child who wants his favorite toy car (EO<sub>1</sub>) and it is not in its usual place (EO<sub>2</sub>) may say “*Where’s my car?*” Secondly, the third EO for the “*Who?*” question occurred when the information after the “*Where?*” mand established additional information as valuable (EO<sub>3</sub>) as in “*I gave your car to the teacher*” (Sundberg et al., 2002).

Two studies currently in preparation investigated teaching young preschool children with ASD to ask “*What’s that?*” and “*Where is it?*” questions separately by creating high EOs and using a prompting procedure for teaching (Ostry, in preparation). The results for all participants were positive with all six participants across the two studies learning to ask and generalize these wh-questions in less than five teaching sessions. A natural extension of the current research is examination of the two questions in order to investigate whether individuals with ASD can discriminate between using “*What’s that?*” and “*Where is it?*” when presented with random discrimination trials, requiring one of the two questions to be asked in the appropriate context.

### *Summary*

An overarching goal of communication is the effective relaying and receiving of information, needs, or thoughts in a shared medium that has communicative intent to affect the receiver's behavior in some way (Bogdashina, 2005). As noted by researchers, being a competent communicator goes beyond expressing wants and needs, and includes the ability to ask and respond to wh-questions. (Light & Binger, 1998). However, individuals with ASD are described as having markedly abnormal or impaired communication skills, and may need to be explicitly taught the functional communications of wh-question asking. This may be a difficult task as many individuals with ASD tend to be more tangibly reinforced than socially. Therefore, it is important to arrange motivating situations in which individuals really want to know the answers to the questions, and that the correct function of their behaviors are being reinforced (Cooper et al., 2007; Skinner, 1957; 1974; Sundberg et al., 2002). Comprehending and answering wh-questions is an important skill for individuals with ASD to learn so they can understand their environments, have control over their communications, learn new vocabulary, and simply to allow them a functional way to initiate communications; an entitlement for all individuals.

Children with ASD receptively and expressively learn the wh-questions in the same order as neurotypical children, but at a slower rate, and many require explicit teaching to master these skills. The literature suggests that all children learn to comprehend and receptively respond to wh-question before expressively using them. (Bloom et al., 1982; Davis, 1932; Fahey, 1942; Lee & Ashmore, 1983; Lord et al., 2004;

Meyer & Shane, 1973; Merkin et al., 1980; Miller, 1981; Peeters & Gillberg, 1999; Smith, 1933; Tyack & Ingram, 1976).

Presently, there is no single method for specifically teaching the wh-questions to individuals with ASD, but the most empirically-validated methods for teaching this population are based upon the use of ABA (Cooper et al., 2007). One of the empirically supported communication intervention methods based on the principles of ABA is known as didactic teaching (Goldstein, 2002; Rogers, 2006; Volkmar, Paul, Klin, & Cohen, 2005). Didactic teaching is structured and teacher-directed, and includes procedures in which individuals are always provided with prompts to ensure correct responses are given so the child does not learn and practice errors (Kitchen, 2005).

As wh-questions require socially-based answers, individuals with ASD need to be fully engaged in the communication exchange. However, a core deficit of individuals with ASD is attending behavior. According to Striefel (1974) in order for learners to imitate, they need to *attend* to their present situation by (1) staying in the seat, (2) looking at the teacher/instructor, (3) keeping their hands in their laps so individuals are focused and not distracted by other items, or using their hands appropriately to partake in the present situation, and (4) looking at items that are being used in the present task (Cooper et al., 2007). Attending behavior is a pre-requisite of joint attention which is a cluster of behaviors that share a common goal of communicating with another about an event or entity (Bruinsma et al., 2004; Cipani, 2008; Jones & Carr, 2004; Koegel et al., 1998b; Mundy & Crowson, 1997; Rollins et al., 1998). Therefore, in order for individuals with ASD to progress to having joint attention, it is imperative that attending behavior is given due consideration when teaching communication.

There is a small empirical research base related to teaching vocal children with ASD to learn to ask wh-questions, however, some of the studies do not examine the behaviors in relation to the EOs and reinforcements (Sundberg, et al., 2002). Three published studies (Koegel et al., 1998; Sundberg, et al., 2002; Williams et al., 2000) and two studies in preparation (Ostry & Wolfe, under review; Ostry, in preparation) successfully have taught children with ASD to ask “*What’s that?*” and “*Where is it?*” questions, and included an analysis of behavioral functions. The research suggests that individuals with ASD using ABA methods can be taught to appropriately ask “*What’s that?*” and “*Where is it?*” by ensuring correct EOs are identified, and that individuals with ASD are *attending* to the communication teaching tasks.

## CHAPTER 3

### Method

The procedures implemented in this study were based on methodologies used by Koegel and colleagues (1998a), Sundberg et al., (2002), Taylor and Harris, (1995), and Williams et al., (2000), in their investigations of teaching participants with ASD how to ask wh-questions. This study replicated the aforementioned researchers' methods in order to teach "What's that?" and "Where is it?" to preschool children with ASD. The current study extends the previous research by examining whether young children with ASD could discriminate between asking wh-question. The research questions are: can preschool children with ASD discriminate between using "What's that?" and "Where is it?" when presented with random discrimination trials? and what effect does teaching "What's that?" to preschool children with ASD have on learning novel vocabulary?

#### *Participants and Setting*

The participants attended a public preschool for children having developmental disabilities in central Pennsylvania. The participants were taught in a self-contained classroom with eight peers having disabilities. The class was taught by one classroom teacher and several aides (approximately one aide per child). Some children in the class attended school all day; others attended mornings or afternoons only. To be included in the study participants had to be (a) diagnosed with an autism spectrum disorder (determined by a formal diagnosis, written in the IEP, or by their class placement), (b) able to mand for items as determined by parent and teacher screener questionnaires, (c) able to tact as determined by parent and teacher screener questionnaires, and then a subsequent tacting assessment with the investigator, (d) unable to ask (or previously



never formally taught to ask) “*What’s that?*” and “*Where is it?*” as determined by parent and teacher screener questionnaires and a subsequent assessment conducted by the investigator to validate the results of the screener.

Three participants diagnosed as having ASD participated in the study. Rita was four years, eleven months old with ASD (school records did not indicate at what age she received her diagnosis). Rita typically did not listen to instructions but tended to scroll through verbal communications until she said the correct response. Joann was four years, two months old (diagnosed at three years of age). Joann displayed instances of injurious behavior such as biting and hitting and screamed “no” loudly when she did not want to complete a task. Henry was three years, five months old (diagnosed at two years). Henry had attention problems and could not sit at a desk for more than approximately five minutes. When Henry did not want to participate in a task, or attend to a person, he would roll his eyes up and stare upwards.

The room used for this study was opposite the *free-play area* in the developmental center and measured 166 by 80 inches. There was a desk against one wall, four chairs, as well as a cupboard, filing cabinet, and two bookcases all located against the walls. The teaching occurred at a table measuring 36 by 36 inches which was situated in the center of the room. The room was familiar to all participants.

### *Training and Agreement*

*Assistant training.* The research assistants, and first and second coders, who assisted in the study were final year masters students in psychology with interests in working with children with ASD. The research assistants underwent training in the form of explanations, watching video tapes of the procedures from a previous study, and

testing their knowledge of what constituted the dependent variables and attending behavior in verbal tests. They practiced filling out data sheets by watching some practice session videos and comparing their answers with the correct answers, discussing the discrepancies, and receiving feedback from the investigator. The research assistants continued to practice and receive feedback on their coding responses until they demonstrated a 100% correct response rate on two separate occasions.

*Interobserver agreement.* Interobserver agreement of participant observations was examined by watching video tapes of the sessions and completing data sheets. All sessions were viewed by two coders; 100% agreement was achieved for the assessments, intervention, attending behavior, and procedures.

*Treatment Fidelity.* The two research assistants also completed procedural checklists to ensure that procedures were consistently implemented in each session. All sessions were viewed by the two research assistants; 100% agreement was achieved for the assessments, intervention, attending behavior, and procedures.

### *Materials*

Materials used for the teaching and discrimination trials for “*What’s that?*” consisted of 43 toys that were hidden in large, black, plastic bags. The toys hidden in the bag had flashing lights, moved, and made noises or music (Appendix L). Materials used for teaching “*Where is it?*” consisted of 60 small items (e.g., toys, edibles), a container with a flip-up lid, a silver canister, and a brown box. A VHS video camera on a tripod in the corner of the room was used to record each session. After each session the two research assistants watched the sessions on tape and completed the data sheets.

### *Independent and Dependent Variables*

In the current study the independent variable was the implementation of a prompting procedure to teach “*What’s that?*” and “*Where is it?*” This prompting procedure consisted of (1) first facial prompt (expectant look), (2) first verbal prompt, (3) second verbal prompt, (4) third verbal prompt, (5) fourth verbal prompt, and (5) fifth full model and verbal prompt by the investigator. After item presentation, there was a two-second response interval until the prompt was instigated, and a further two-second response interval between prompts if correct response was still not given. The verbal prompt was either “*What’s that?*” or “*Where is it?*” After four consecutive, spontaneous, independent instances of asking, teaching was deemed complete, the session completed, and no further teaching implemented.

The first dependent variable in the current was the participants’ correct, unprompted, spontaneous, independent utterance of “*What’s that?*” when presented with an item that could not be identified, and “*Where is it?*” when presented with an empty container and asked to retrieve an item from inside the container. These utterances were recorded as correct responses of question-asking. Mastery of learning constituted four spontaneous independent consecutive question responses. Mastery for discriminating between “*What’s that?*” and “*Where is it?*” was 80% correct responses for two consecutive sessions. The second dependent variable in the study was the number of items labeled by the participants in a pre- and post-knowledge assessment. Although not a formal dependent variable, data on the participant’s attending behavior were collected.

### *Procedure Overview*

An overview of the procedures is diagrammed in a flow chart in Appendix A. The first stage of the procedure was to get informed consent for from parents of potential eligible participants (Appendix B). Once informed was obtained, the next step was to recruit participants by asking teachers and parents to fill out screener questionnaires indicating potential participants' current question-asking ability, preposition ability, tacting and manding abilities, and preferred items and activities (Appendix C).

Procedures consisted of the following: First, participants were assessed on their manding skills via a preference assessment to determine what preferred items should be used in the “*Where is it?*” teaching, and how participants typically asked for items they wanted (Appendix D). During the preference assessment, data on attending behavior were collected to ensure that participants were fully engaged in the communication exchange. Acts of attending behavior were collected and scored against a preset criterion of at least one attending behavior act per item presentation (Appendix E). If it was determined that formal training on attending behavior for participants was necessary, then a training session was designed to be given before instituting baseline.

Second, participants were tested on their receptive knowledge of the “*What?*” and “*Where?*” questions and “*Yes*” and “*No*” questions in order to assess their comprehension of these questions before teaching. This assessment consisted of asking the participant questions about their environment such as “Where is the girl?” (answer: on the swing). Appendix F gives a 2-D example of the receptive assessment, but the actual receptive assessment was conducted in the participant's natural environments such

as in the school playground and classroom. Appendix F also contains the data sheet used to score responses.

Third, participants were assessed on their knowledge of item names and tacting ability. The items used for the pre-knowledge assessment were the toys used for teaching and discrimination trials for “*What’s that?*” and common items that the participants were able to label as determined by the parent and teacher screener questionnaires. Each participant was presented with four items (two known and two possibly unknown) and asked to expressively tact the items. The number of items the participant correctly tacted comprised their pre-knowledge assessment score, that was later compared to their post-knowledge assessment score after completion of the study (Appendix G). A selection of pictures of these items can be found in Appendix L.

Fourth, baseline was taken for the questions “*What’s that?*” and “*Where is it?*” (Phase I) followed by Phase II; teaching of “*What’s that?*” using the prompting procedure (Appendix H and I). The teaching sessions in Phases II consisted of 20 “*What’s that?*” teaching trials. This teaching session was followed by a discrimination session that consisted of ten “*What’s that?*” and ten “*Where is it?*” trials. The teaching sessions in Phase III consisted of 20 “*Where is it?*” teaching trials followed by discrimination sessions. There was always one teaching session followed by one discrimination session per day. During the discrimination sessions participants were presented with a situation in which either a “*What’s that?*” or “*Where’s that?*” response was required. Participants then had to decide which question should be used given the situation. Discrimination trials were created by placing ten “*What’s that?*” and ten “*Where is it?*” pieces of paper in a box and pulling them out. Each participant followed

the same order. Once participants had demonstrated four independent, consecutive question-asking instances, they exited the phase. When participants demonstrated question-asking discrimination for “*What’s that?*” or “*Where’s that?*” for two consecutive sessions they had completed the study. As noted previously each session was coded by two assistants for interobserver reliability. Finally, a four question type likert questionnaire was given to the educators of the participants to assess the social validity of the teaching procedure and effects (Appendix K).

### *Participant Assessments*

*Informed consent.* Informed consent forms were distributed to the parents of children who were aged between 3-5 years with a diagnosis of ASD. This consent form stated that if they would like their child to participate in the study, and if s/he met study criteria, then their child would be videotaped. (Appendix B).

*Recruitment of participants.* After obtaining consent, participants were recruited by giving parents and teachers screener questionnaires to determine participants’ question-asking ability, tacting, manding, preposition abilities, and preferred items and activities. Responses to these screeners determined whether the participant was eligible to participate by not having the ability to communicate “*What’s that?*” and “*Where is it?*” There was also a request in the screener for information for tacting and reinforcements. Four participants were screened to ensure that three were employed for the study. The fourth parent decided to withdraw her consent (Appendix C).

*Preference assessment.* A preference assessment was administered to determine what items the participants favored so they would be motivated to ask “*Where is it?*” when the items were hidden in Phase III. In order to conduct this assessment, the

participants sat opposite the investigator and were presented with highly-preferred items (determined by the parent and teacher screener questionnaires). The participants were requested to mand for the item (to assess manding ability of the items) they wanted to play with, and given ten seconds to play with the chosen item. These items were rotated with three items available to participants at any time. When the participant manded for an item four times, it was classified as a high preference reinforcer, two times as a medium preference reinforcer, and once as a low preference reinforcer. See Appendix D for preference assessment.

*Attending behavior.* During this preference assessment, attending behavior data was collected to determine whether attending skills required formal training, to be given before baseline. Attending acts were not a dependent variable investigated in this study, but were recorded during the preference assessment to ensure that participants demonstrated attending acts during the communication. Attending behavior acts were operationalized and documented as follows (1) looking at the teacher/instructor, (2) keeping their hands in their laps so they are focused and not distracted by other items, or using their hands appropriately to partake in the present situation, and (3) looking at items that are being used in the present task. The participant was only scored on attending acts if they were sitting in their seats, facing the correct direction, and both legs under the table. The attending training procedure was as follows. First, the investigator sat on the floor opposite the participant. Second, the investigator had a box of highly desired items such as favorite toys and edibles. Third, the investigator held an item and waited for the participant's eye contact, or eye contact approximation. Once the participant engaged at looking at the item/investigator, s/he received the item. This procedure was repeated,

reinforcing successive approximations of eye contact until the participant displayed explicit eye contact with the investigator and item after presentation of the item in the environment. The presentations occurred as rapid trials until ten consecutive trials occurred in which the participant made eye contact on the initial presentation of the reinforcement. Appendix E contains the data sheet for the attending behavior assessment. The exit criterion for attending behavior was at least one attending act per trial presentation for ten consecutive trials.

*Receptive knowledge assessment.* A receptive knowledge assessment was used in the current study in which participants were asked “*What?*” “*Where?*” “*Yes,*” and “*No*” questions about items in their physical environments with which they were familiar (as determined by parental and teacher screening questions). For instance, one participant was taken to the school playground and asked (1) “Where is the little girl sitting?” (answer: on the swing) (2) “Is the boy holding a balloon? (answer: no) (3) “What is the boy eating?” (answer: crackers) (4) “Is the girl holding a ball?” (answer: yes) (Appendix F). If participants reached 75% criteria they continued in the study. If participants did not reach 75% criteria and therefore did not demonstrate adequate receptive knowledge of the “*What?*” and “*Where?*” questions, they exited the study. A 2-D example of the receptive assessment and data sheet are displayed in Appendix F.

*Pre- and post-knowledge assessment.* In order to measure whether the participants learned new vocabulary after asking “*What’s that?*” they were first assessed on what items were known from the items used in Phase II. The procedure for the pre- and post-knowledge assessments was as follows. The investigator sat with the participant and presented two Phase II items and two known items, as determined by the parent and



teacher screener questionnaires, for the participant to tact (such as cup and spoon). The participants were asked to expressively label the items to assess which items were known and unknown. Data were recorded for tacting instances. There was no criterion for pre-knowledge assessment. The toys that were unknown were used in the all three phases of the study and then tested again in a post-knowledge assessment after the participant mastered asking “*What’s that?*” and had been told the name of the toy. The scoring sheet for the pre-and post-knowledge assessments can be found in Appendix G.

### *Experimental Design and Conditions*

A multiple-baseline design across three participants was employed for this study (Kennedy, 2005; Kazdin, 1982). The study consisted of three phases; Phase I was baseline for the discrimination of the questions “*What’s that?*” and “*Where is it?*” Phase II was teaching “*What’s that?*” using the prompting procedure and discrimination for both “*What’s that?*” and “*Where is it?*” Phase III was teaching “*Where is it?*” using the prompting procedure and discrimination for both questions. Please refer to the flow diagram in Appendix A.

*Phase I: Baseline for discrimination of “what’s that?” and “where is it?”* During baseline the participant sat at a diagonal angle to the investigator at a small table. To assess the “*What’s that?*” question, the research assistant placed an item in a bag on the table approximately 10 inches away from the participant so the participant could see something was in the bag (to increase motivation, items were visually and auditory stimulating such as noises, moving, and flashing lights). The investigator did not prompt the participant to ask “*What’s that?*” If after five seconds, the participant had not asked

“*What’s that?*” the research assistant took the bag away. The participant’s verbal behavior (if any) was recorded.

To assess the “*Where is it?*” question, the research assistant placed one of the previously identified small preferred items and a familiar container on the table. The investigator gave the small preferred item to the participant and then in view of the participant, put the item in the container and gave it to the research assistant. The research assistant then gave the container back to the investigator who offered the container to the participant with the accompanying verbal prompt “*Get your \_\_\_\_ (item).*” The participant could then open the container and find the item. The participant then could play with the item for ten seconds, or hand it back the investigator. Next, the research assistant placed another of the small preferred items and the container on the table in the container. The investigator gave the item to the participant and then again in view of the participant, put the item in the container and gave it back to the research assistant. The research assistant then took the item out (out of participant’s view) and gave the empty container back to the investigator who again offered the container to the participant with the accompanying verbal prompt “*Get your \_\_\_\_ (item).*” The participant could then opened the container to find the item was not there. The participant’s verbal behavior (if any) was recorded.

There were ten presentations for “*What’s that*” and “*Where is it?*” As long as the data showed zero question-asking ability, the first participant remained in baseline for three sessions. Subsequent participants exited baseline (if data were also zero) when the preceding participant had demonstrated 80% mastery for the “*What’s that?*” question in Phase I.

*Teaching “what’s that?” and discrimination.* When teaching “*What’s that?*” the question the research assistant put an item in a bag on the table, approximately 10 inches away from the participant, so the participant could see that an item was in the bag (to increase motivation, items were visually and auditory stimulating such as noises, moving, and flashing lights). The investigator kept one hand on the bag that contained the item on the table and verbally modeled to the participant by saying “*What’s that?*” and then looked at or pointed to the bag. If the participant did not ask the question “*What’s that?*” the investigator waited two seconds and began the procedure of verbal prompting. When the participant asked “*What’s that?*” the investigator showed the item to the participant and talked about it (e.g. name of item, color, size, sounds it made). The participant manding for the item, or the investigator prompted this mand, or asked “*Would you like to see it?*” or “*Would you like to play with it/have it?*” and the participant could play with it for 20 seconds, and then it was put out of sight. This last part of the trial was implemented so the participant did not ask “*What’s that?*” and immediately received the item, or else the participant may think the question is a mand for the tangible. How the participant received the item depended on their manding ability and ability to answer yes and no questions in the earlier assessments. After each training session, there was a discrimination session in which the participants were presented with a situation in which either “*What’s that?*” or “*Where’s that?*” was required and they had to decide which question should be used. No prompting was implemented during discrimination sessions. During teaching, once the participants demonstrated four independent, consecutive questions asking instances, they exited the Phase II and entered Phase III.

*Teaching “where is it?” and discrimination.* To teach the “*Where is it?*” question, a previously selected preferred item was selected for each trial for each participant. The intervention began as in the baseline in Phase I in which the participant was presented with a container and asked to “*Get your \_\_\_\_\_ (item).*” and then had free access to the item. Following brief contact with the preferred item, the participant was presented with the empty container and asked “*Get your \_\_\_\_\_ (item).*” While the participant was being asked to retrieve the item from inside the container, the research assistant placed the preferred item in one of two other containers that were placed approximately 60 inches away from the participant on the opposite side of the room. If the participant did not say “*Where is it/ Where is my/the \_\_\_\_\_?*” the investigator verbally prompted “*Where is it?*” and implemented the prompt procedure for the participant to ask the question. If the participant did ask “*Where is it?*” they were told where the item was (“*in the pink box*” or “*in the silver canister*”) and then told s/he could get up from the table and retrieve the item. If necessary this was physically prompted by the research assistant guiding the child by the hand or arm over to the container to retrieve the item. After retrieval of the item, the participant could play with the item for 20 seconds, or hand it back to the investigator. The item was then put out of sight. During teaching, once the participant demonstrated four independent, consecutive question asking instances, the participant exited Phase III, and was given the post-knowledge assessment. After each training session, there was a discrimination session in which the participants were presented with a situation in which either “*What’s that?*” or “*Where is it?*” was required and they had to decide which question should be used. No prompting was implemented during these sessions.

*Post-knowledge assessment.* A post-knowledge assessment measured if any new vocabulary was acquired. Responses were recorded and compared to the pre-knowledge assessment scores. After mastery of two discrimination sessions in Phase III, participants were presented with the same unknown items used in the pre-knowledge assessment. These items had been used in the teaching sessions in Phase II in which participants had been told the item names.

#### *Analysis*

The data were analyzed using visual inspection of graphs. Change in level or trend were examined. For mastery to occur in the teaching phase, participants were required to achieve four independent, consecutive question-asking instances for both wh-questions.

#### *Social Validity*

After the study was completed, a four question likert type questionnaire was distributed to educators of the participants. The questionnaire asked educators to indicate their level of agreement (strongly disagree to strongly agree) in order to assess their perceptions related to the teaching procedure and effectiveness of outcomes (Appendix K).

## CHAPTER 4

### Results

Chapter 4 presents the results of the study and is organized into three sections. The first section focuses on an overview of what assessments were used to select items for the teaching “*Where is it?*” in Phase III and the results of these assessments. The second section of Chapter 4 details the results of the baselines, teaching trials, discrimination trials for “*What’s that?*” and “*Where is it?*” and new vocabulary learned. Finally, the third section of the chapter details reliability and social validity results.

#### *Assessments*

*Preference assessment.* After the screener was administered, favorite items were collected for each participant and preference assessment trials were implemented to identify the small items that the participants preferred to be used in the “*Where is it?*” baseline, teaching, and discrimination trials. Results from the preference assessment indicated that Joann preferred a play tea set, whistles, chocolate chips, pretend-play doctor toys, and an electronic Elmo toy. Rita preferred plush and plastic animals, vehicles, television characters, and chocolate chips. Henry preferred only wooden or plastic toys (preferably in red) including vehicles, Lincoln Log pieces, Mickey Mouse, dinosaurs, pretend-play doctor toys, an electronic Elmo toy, and a piggy bank; he did not like food or plush toys. Please refer to Appendix D for a copy of the preference assessment data sheet.

*Attending behavior.* During the preference assessment, instances of attending behavior were recorded for each participant. As noted previously, a predetermined criterion of one attending behavior per trial was used to ascertain whether participants

required attending behavior training. The number of instances of attending behavior recorded during 11 item presentations for Joann, Rita, and Henry, were 16, 18, and 43 respectively. That is, while the participants were sitting at the table and being shown a selection of items, each of them displayed at least one attending behavior act during one of the item presentation trials. The minimum number of required attending behavior acts was 11, and thus, all participants exceeded a total of 11 attending acts and, therefore, did not require attending behavior training.

Secondary analysis of the data was collected on attending behavior for Henry as his first two data points in Phase II, sessions 9 and 10 (teaching “*What’s that?*” and discrimination between both questions) were 0% and 5% correct respectively. The results showed that Henry demonstrated 14 instances of out-of-seat behavior on session nine, and three instances of out-of-seat behavior on session 10. Subsequent out-of-seat behavior in other sessions was zero. Out-of-seat behavior was defined as not sitting on the chair at the table, with both legs under the table, thus not attending to the items on the table.

*Receptive knowledge assessment.* The receptive knowledge test was implemented to ensure that participants receptively understood the questions “*What’s that?*” and “*Where is it?*” The results of the receptive knowledge assessment for Rita, Joann, and Henry, were 88%, 82%, and 78% respectively. Because all participants exceeded the predetermined criteria of 75% correct responses, all participants were eligible to take part in the study. Please refer to Appendix F for a copy of the receptive knowledge assessment.

*Pre- and post-knowledge assessments.* Pre- and post-knowledge assessments were implemented in order to assess if the participants learned any new vocabulary after study completion. Before baseline, the pre-knowledge assessment was given. During this assessment, participants were asked to tact four items presented on the table (two items which were to be used during teaching and discrimination trials for “*What’s that?*” and two other items were non-study related items, such as a plate, gloves, and a cup). The score on the pre-knowledge assessment was compared with the post-knowledge assessment score to measure new vocabulary. During the pre-knowledge assessment, Henry labeled four toys, Joann labeled two, and Rita labeled three, out of the 36 toys to be used in teaching “*What’s that?*” and discrimination trials.

After the participants had completed Phase III, a post-knowledge assessment was administered to each participant using the same methods as in the pre-knowledge assessment. Participants were only assessed on toys that they had been exposed to at a minimum of two times during the teaching or discrimination trials. Some of the toys used for the pre-knowledge assessment were not used for the post-knowledge assessment due to low interest by participants as evidenced by lack of manding for the item after it had been identified for the child, saying “no” to being offered the item, pushing the item away, or giving the item back to the investigator for two separate trials. For instance, Henry did not mand, or accept when offered, or reach for, soft or plush toys so the soft Pooh Bear, cat, piano, and Shrek were removed. In the post-knowledge assessment Rita labeled 13 new items correctly, Joann labeled 15, and Henry labeled 8 new items correctly.



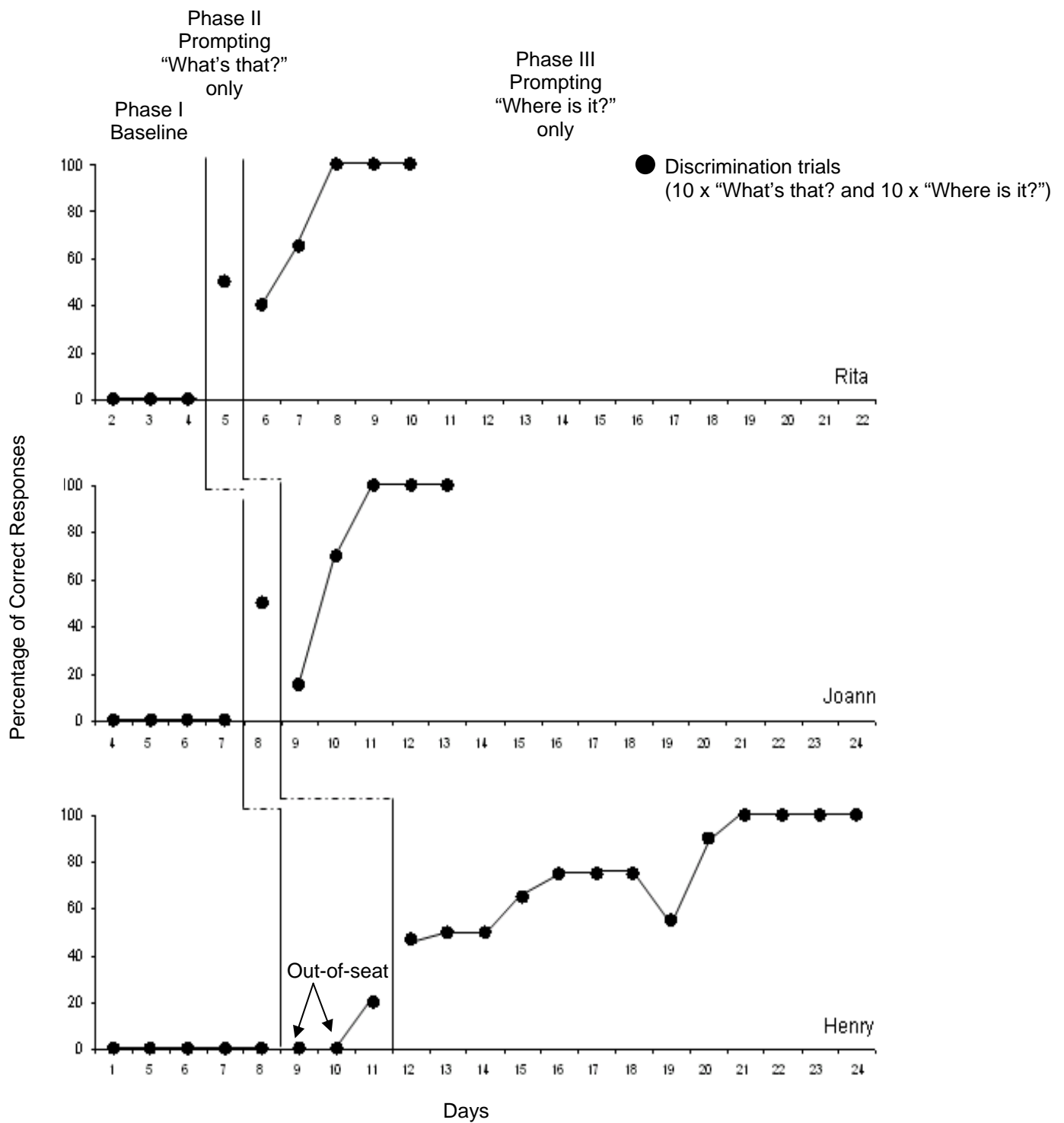
### *Discrimination*

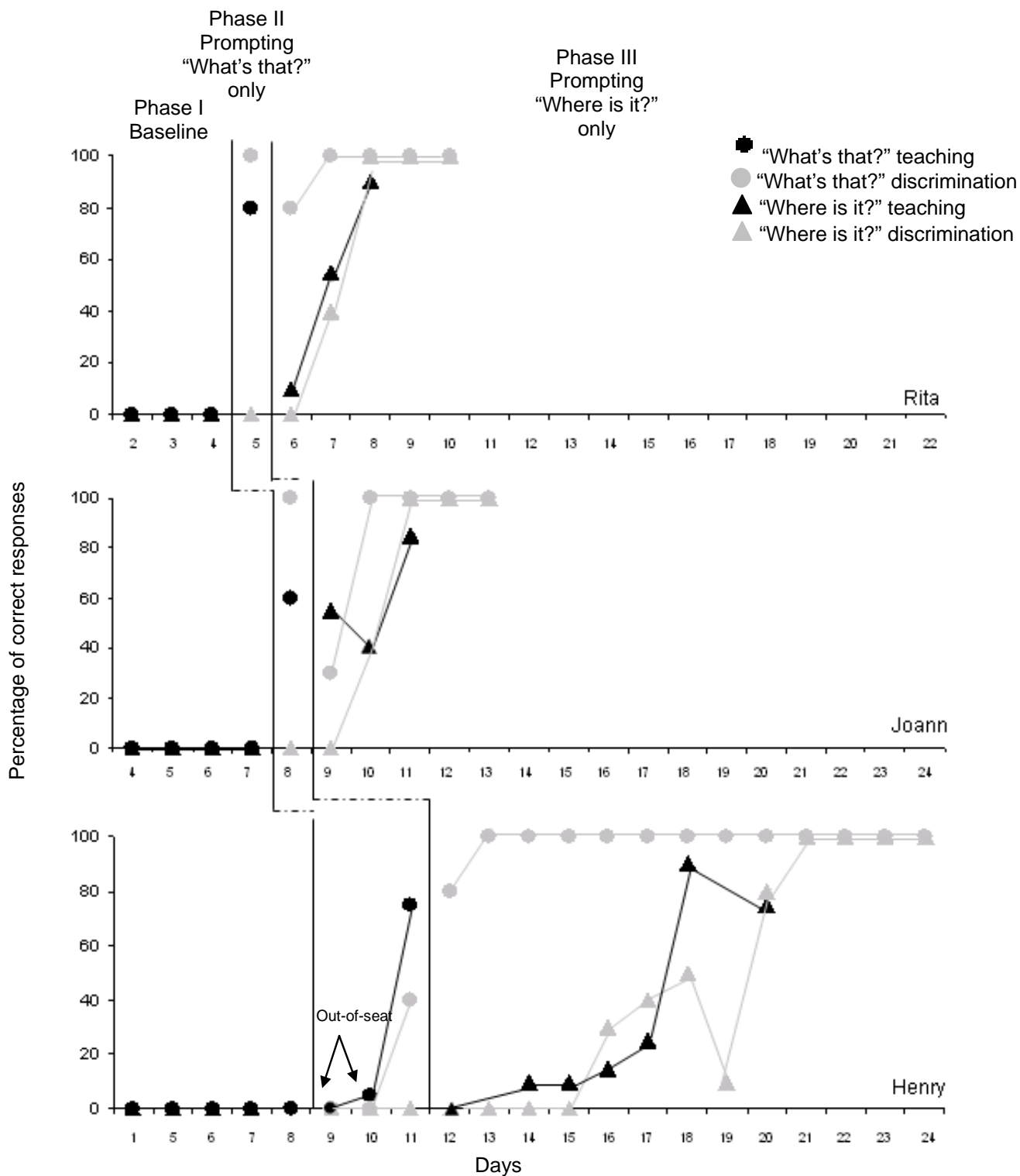
A discrimination session consisted of ten random “*What’s that?*” and ten random “*Where is it?*” trials. Figure 1 shows the percentage of correct responses in the discrimination trials for “*What’s that?*” and “*Where is it?*” Figure 2 shows the percentage of correct responses after participants had received teaching for “*What’s that?*” and “*Where is it?*” as well as the percentage of correct responses displayed separately for each question during the discrimination sessions.

Rita required one teaching session to master “*What’s that?*” and three teaching sessions to master and “*Where is it?*” Rita successfully demonstrated discrimination between the two questions in discrimination trials for three consecutive sessions. Joann also achieved mastery of asking “*What’s that?*” after one teaching session and required three teaching sessions for “*Where is it?*” Rita was able to discriminate between the two questions for three consecutive discrimination sessions.

As shown in Figure 2, Henry required three teaching sessions to master asking “*What’s that?*” and seven sessions to master asking “*Where is it?*” As Henry had reached the 80% mastery level for “*Where is it?*” at session 18, (after six teaching sessions) teaching for this question ended. However, because his responses on the next day’s discrimination session dropped to 55%, and he demonstrated a slower learning curve than the other two participants, he received one additional teaching session for “*Where is it?*” The additional teaching session was included as Henry had not previously demonstrated fluency in this skill and therefore, more practice was given. His responses on the subsequent sessions were 90%, 100%, 100%, 100%, 100%, 100%. Henry had

three extra discrimination testing sessions to demonstrate he had learned to successfully discriminate.





### *Reliability*

Reliability was conducted between the first and second coder for the number of correct responses, level of prompting used, preference assessment, attending behavior and pre and post knowledge assessments. Results of reliability checks indicated 100% agreement for both coders on all assessment measures. Reliability was calculated by *agreement* divided by *agreement plus disagreement*, multiplied by 100.

### *Social Validity*

Four likert type questions were given to four educators working with the participants in order to assess the perceived effectiveness of teaching method used in this study, and changes in the participants' question-asking behavior. The results of the questionnaire indicate that all educators agreed that the teaching procedure could be used in a classroom or other natural environment. They also rated the procedure as *easy to very easy* for a parent to implement, if given training; *agreed to strongly agreed* that the participants' question-asking (of "What's that?" and "Where is it?") increased during the study; and agreed that participants' question-asking behavior continued to increase after study completion.

## Chapter 5

### Discussion

The current study examined whether preschool children with ASD could discriminate between appropriate question-asking of “*What’s that?*” and “*Where is it?*” when presented with random discrimination trials requiring one of the two responses (Figure 1). A predetermined criteria of 20 correct questions (10 for “*What’s that?*” and 10 for “*Where is it?*”) was met by all the participants for three consecutive discrimination sessions. The results demonstrate that participants with ASD were able to correctly ask the two wh-questions, and discriminate when to use each question. Furthermore, participants learned new vocabulary in a relatively short amount of time (between 6-16 sessions) using a prompting procedure, and motivating EOs by use of highly preferred items.

This study extends the current research available related to wh-question asking for young children with ASD in several ways. First, the results present a replication of findings for teaching “*What’s that?*” (Koegel et al., 1998a; Taylor & Harris, 1995; Williams et al., 2000), and “*Where is it?*” (Sundberg et al., 2002) to young children with ASD. Second, this investigation is the first known study to examine the effects of teaching two wh-questions together, thus enabling examination of students’ ability to discriminate between two wh-questions. Discrimination between the questions “*What’s that?*” and “*Where is it?*” demonstrated that the participants established appropriate expressive discriminative repertoires and were skilled at determining which of the two possible wh-questions was correct in a given situation.

Previous studies that examined the use of a single wh-question demonstrated only that participants could complete one stimulus-response correctly (such as being presented with stimuli and asking one question). In previous wh-question research there was no other competing stimulus-response that participants had to consider, and thus, the participants in the studies did not demonstrate the ability to discriminate *when* the particular wh-question was required. Discrimination of question-asking is a critical conversational skill with significant practical importance for children with ASD to be competent communicators and function in everyday communicative situations. Being a competent communicator involves identifying appropriate opportunities to ask questions and being able to actively participate in conversational exchanges and thus requires the ability to discriminate between using questions (Light, 1988, 1989, 2003; Ostry et al., 2008).

Finally, results from the pre and post knowledge assessments demonstrate that new vocabulary was acquired by all participants. The number of sessions required by the participants to learn the new vocabulary was less than in a previous study (Taylor & Harris, 1995). Furthermore, two participants in the current study also acquired more new words (in less sessions) than in previous research (Taylor & Harris, 1995).

#### *Discrimination Between Wh-Questions*

The present study was comprised of three phases. Phase I was a baseline measurement in which ten trials for asking both “*What’s that?*” and “*Where is it?*” were presented to the participants with no prompts. Phase II taught “*What’s that?*” and after each teaching session, a discrimination session identical to baseline was presented. Phase III taught “*Where is it?*” and after each teaching session, another discrimination session

was implemented. As shown in Figure 1, all participants were unable to provide a correct response in Phase I. The figure depicts an immediate increase in correct responses for both Rita and Joann upon introduction of teaching in Phase II. It is interesting to note that, upon introduction of Phase III, the percentage of correct responses in the discrimination sessions actually decreased for Rita and Joann but then returned to 100%.

The decrease in correct responses of participants may have been due to the required discrimination needed between the two questions. This “*temporary decline*” in performance is a common occurrence in language development (Reichle & Sigafos, 1991, p.199). Research has shown that it is easier to establish the first expressive discrimination but that performance on that first previously mastered response often deteriorates when another stimulus-response is introduced (such as teaching the second question in response to a different stimulus, as opposed to teaching the first question) (Reichle & Sigafos, 1991). This phenomenon may be evident in the current study. Specifically, the previously mastered response by participants when seeing an object hidden in a bag was “*What’s that?*” However, participants also asked “*What’s that?*” when presented with the empty box, the discriminative stimulus for the question “*Where is it?*” This finding may indicate that participants’ appropriate discriminative repertoires were not fully developed when their correct responses decreased (Reichle & Sigafos, 1991).

The results of the current study also suggest that teaching was necessary to assist participants in emitting the correct response. The teaching sessions implemented before the discrimination sessions entailed prompting the correct question, subsequently fading these prompts, and providing reinforcement for the correct question (such as being told

the location of their toy in Phase III) (Reichle & Sigafos, 1991; Terence, 1963). Thus, the results may indicate that the participants received sufficient question-asking practice during teaching in Phases I and II to recover from this “*temporary decline*” (Reichle & Sigafos, 1991, p.199). Once the participants successfully discriminated between asking the two questions, their responses were maintained by differential reinforcement (Reichle & Sigafos, 1991).

Having the ability to discriminate between two wh-questions is an important finding as typically young children with ASD are taught to mand for tangibles, ask one wh-question in isolation, or to demonstrate their abilities to receptively answer wh-questions (Brown et al., 1971). However, the results of this study demonstrated that young children with ASD can learn to discriminate between asking two wh-questions in less time than previous studies that only taught one wh-question, and with greater accuracy (Koegel et al., 1998a; Taylor & Harris, 1995; Williams et al., 2000). Perhaps these findings suggest that learning wh-questions is faster when there is a competing stimulus-response (a second wh-question) as individuals with ASD are required to begin immediate discrimination learning.

#### *Acquisition of the “What’s that?” and “Where it is?” Questions*

Although all three participants successfully discriminated between asking the two questions, Henry’s data were different from the other two participants; his correct responses on the discrimination sessions remained at zero for two additional sessions once Phase II had begun. Data in Figure 2 may elucidate his results. This figure depicts how correct responses in teaching in Phases II and III correlate with the discrimination data. Specifically, the results show that Henry required two teaching sessions before he



began to respond correctly in Phase I. However, Henry's percentage on the third session on Phase II increased significantly from one (5% on the second session) to fifteen (75%) correct responses. The delay in the percentage of correct responses for Henry may be due to several factors. First, Henry was the youngest participant in the study, (3.5 years); Rita and Joann were six months and ten months older than Henry respectively. Thus, Henry's younger age may have been a variable in his slower learning progress in comparison to the other participants, a finding paralleled in other communication research related to NT children (Lee & Ashmore, 1983).

Second, Henry engaged in out-of-seat-behavior during the first two learning sessions in Phase II, identified during a secondary analysis of his data (re-watching the session tapes). Henry's out-of-seat behavior may have affected his lack of engagement of the task and therefore, resulted in a lower rate of acquisition of learning in Phase II. Henry's behavior also may explain why his responses on sessions nine and ten in Phase II were so low. Interestingly, Henry's percentage of correct responses dramatically rose on session eleven. Again, secondary analysis of the data indicated that Henry remained in his seat for the entire session strengthening lack of engagement as a possible explanation for his low response rate.

Because Henry's rate of acquisition of learning "*Where is it?*" and discriminating between the two questions was slower than the other two participants (as his data showed a decrease (to 10%) in discrimination at session 19), it was determined that Henry should receive additional training. Therefore a training session for "*Where is it?*" was implemented before his next discrimination session (session 20). However, it is unclear whether the additional teaching session had an effect on the subsequent correct responses.

Rather than additional teaching, the data may reflect a similar pattern found with Rita (session 6) and Joann (session ten) in which Henry was learning to discriminate between the two questions and would have *recovered* on his own without an additional teaching session.

As shown in Figure 2, teaching in Phase II for Rita and Joann was only one day, and in Phase III, only three days; after these few teaching sessions both participants achieved 100% in three trials. This rate of acquisition can be considered rapid as participants had to learn each wh-question and then demonstrate discrimination. These results support using a prompting procedure for teaching wh-questions to preschoolers with ASD (Koegel et al., 1998a; Taylor & Harris, 1995; Williams et al., 2000; Williams et al., 2003), and also that contriving EOs that increase motivation may be an important component of teaching self-initiated communication with children with ASD (Sundberg et al., 2002). Using a prompting procedure for teaching may better ensure that the child never gives an incorrect answer, so the teaching environment remains high and reinforcement can remain positive (Kitchen, 2005).

#### *Acquisition of Novel Vocabulary*

The questions that participants were taught can be classified as mands for information (Cooper et al., 2007; Skinner, 1957, 1974). For instance, when asking “*Where is it?*” the participants were told the locations of the hidden highly-preferred items (“*Mickey Mouse is in the brown box*”) and permitted to retrieve them. When taught to ask “*What’s that?*” the participants were given the names of the items that were hidden in the bags (“*It’s Shek, the ogre from the movie*”). Thus, given conditions in the current study participants learned item names as evidenced on the pre and post-

knowledge assessments. In the post-knowledge assessment Rita learned 13 item names in 6 days, Joann learned 15 in 5 days, and Henry 8 in 16 days. Although it is possible that the participants may have had added exposure to the same toys outside of the study, it is highly likely that they acquired the new vocabulary as a result of the intervention.

Further, the acquisition rate of novel vocabulary among the participants in this study was rapid when compared to other research. Specifically, two participants in Taylor and Harris' (1995) study acquired ten new expressive words in 72 and 83 sessions, with a 80% mastery criteria; a third participant did not reach criteria but learned five out of the ten words in 49 sessions. Three sessions were presented per day for all participants. This comparison shows rapid acquisition of new vocabulary for these participants, but still slower than NT children who typically acquire about five new words per day. It is possible that the items in the current study had higher reinforcement value and were more engaging for participants, thus explaining the greater number of new vocabulary words learned.

#### *Attending Behavior and Establishing Operations*

Participants in the current study did not require attending behavior training as determined by a preset criterion. However, the results from this study have highlighted two interesting points related to attending behavior. As documented in the literature, attending behavior is critical for the acquisition of new skills and needs to be assessed and taught, to ensure optimal skill acquisition (Jones & Carr, 2004; Howlin et al., 2000; Moore & Dunham, 1995; Mundy & Crowson, 1997; Schreidman et al., 1996; Sigman & Ruskin, 1999; Whalen et al., 2006; Venter et al., 1992). As discussed previously, lack of attending behavior (such as Henry's out-of-seat behavior) may be responsible in part for

the lower number of correct responses. Lack of attending behavior found in this study supports previous research findings. Specifically, the participant in Taylor and Harris' (1995) study who did reach mastery of acquiring novel vocabulary was described as being "*inattentive*" (p.9). These researchers noted that lack of attending behavior may have been the basis for the participant's "*failure to master half the material*" (Taylor & Harris, 1995, p.9).

A second interesting point to consider is that attending behavior may be correlated with establishing operations and motivation because individuals are more likely to attend to situations, objects, and people that have high reinforcement value. Specifically, identifying EOs such as offering participants highly-preferred items is more likely to increase their attending behavior. Although procedures were employed in this study to contrive high EOs, it is possible that Henry's out-of-seat behavior (and thus, lack of attending behavior) was displayed because he was not being reinforced in the Phase II teaching trials. Specifically, it may have been that the hidden item in the bag was not reinforcing enough to motivate Henry to engage in the task. Requiring two additional teaching sessions for Henry may have been needed for him to associate that by engaging in question asking-behavior he would see and subsequently obtain an item that was reinforcing. Simply stated, Henry may have engaged in question-asking behavior only when his behavior reinforced. This idea is supported by attending behavior data collected during Henry's preference assessment. Specifically, Henry displayed the highest rate of attending behavior among all three participants at a time when he was given free access of playing with preferred toys. When Henry was no longer being reinforced at the start of Phase II, his attending behavior decreased. This finding may suggest that it is important

to contrive effective EOs when teaching children with ASD to learn to ask questions and ensure that the situations are reinforcing.

Although EOs were not a dependent variable, participants in the current study were assessed in order to identify highly-preferred items. The highly preferred items (taken from the parent and teacher screeners and the subsequent preference assessment) then were used to motivate participants to ask the wh-questions in Phases II and III of the study. The functions of participants' question-asking behaviors were for information in the form of answers to their questions, upon which they received the appropriate answer. The response to asking "*What's that?*" was that the participants were told the name of the items and a little extra information such as "*It's a blue piano and you can press the buttons for music,*" and the response to asking "*Where is it?*" was the toy's location, such as "*the horse is in the pink box.*" Supplying the participants these answers to their questions was implemented to ensure the question was a mand for information and not the item itself, and that the participants were learning that the question they were asking was a mand for information and not a mand for the item itself (Michael, 1982, 1988, 1993, 2000; Skinner, 1957, 1974; Sundberg et al., 2002).

The preference assessment procedure also was found to be a useful method of eliminating less favorable items for Phase II of the study. For instance, when Henry had asked "*What's that?*" and was shown plush/soft animals, he said "*no*" when asked if he wanted to play with them. Based on his response, plush toys were removed from his further trials in all phases. Because Henry's question-asking behavior did not occur in the presence of plush/soft items, it is probable that he did not find these items highly reinforcing, thus decreasing his motivation to mand "*What's that?*" Ensuring that EOs

are individualized is important to produce the most reinforcing and motivating situations so children will engage in the desired verbal behaviors

### *Implications of Current Study*

In addition to contributing to the existing wh-asking literature for young children with ASD, the current study highlights several implications for researchers, educators, and parents to consider. When teaching question asking skills to children with ASD it is probably most effective to use containers familiar to the child to teach “*Where?*” questions and novel containers to teach “*What?*” questions. Without the use of familiar containers in discrimination sessions, the child with ASD may ask “*What?*” in response to seeing novel container. An example of this strategy for use by educators may include giving a child with ASD a familiar pencil box used in the classroom for writing. The teacher could then instruct the child to “*Get your pencil,*” The child would then open the pencil box, and finding the box empty, ask “*Where is it (my pencil/ the pencil)?*” (Cooper et al., 2007; Skinner 1957; Sundburg et al., 2002).

When teaching discrimination to young children with ASD, it is also important to remember that there may be a decrease in correct responses indicating that the appropriate expressive discriminative repertoires are being developed. However, if correct response rates do not stabilize after one decrease, then extraneous variables may need to be addressed. If the response rate continues to decrease or remains low, educators may want to consider implementing further teaching sessions.

Results from this study also highlight the importance of collecting preference data probes throughout the teaching and discrimination trials so objects used in the trials can be modified as needed. As noted previously, the objects used with young children with

ASD may be valuable to increase and maintain motivation and increase attending behavior; keeping children's interest is vital for learning. In addition, collecting data related to attending behavior before and during instruction may better ensure that children with ASD fully are engaged in learning and also assist in determining preferred objects. In the current study, lack of engagement may have been responsible for Henry's low response rate in Phase II, and for one participant in Taylor & Harris' (1995) study who did not reach mastery in learning new vocabulary. Furthermore, educators should also consider the current receptive language skill level of the individuals to ensure that teaching is appropriate. It may be inappropriate to teach a young child with ASD to ask a question if they cannot respond to it receptively (Brown et al., 1971).

Finally, it is important to collect social validity feedback about instructional methods used to teach wh-questions and discrimination between the questions from individuals who work with children with ASD, such as teachers and speech-language pathologists. If the teaching procedure is deemed too difficult for educators to implement, then they may refrain from using it; so it is important to ask educators if they would be able to implement teaching in the classroom effectively (Foster & Mash, 1999; Kennedy, 2005). The results from the current social validity assessment favorably rated the prompting procedure by educators concerning ease of use because it included a series of prompts which are typically used in teaching young children with ASD (Cooper et al., 2007). Furthermore, educators and parents can assess changes about improvements in the child's question-asking behavior at home or in the community. It is widely acknowledged that results of instruction are most effective if the instruction is reinforced in the home

environment (Anderson, Avery, Dipietro, Edwards, & Christian, 1987; Schopler and Reichler, 1971; Smith, Buch, & Gamby, 2000).

### *Limitations and Future Research*

As this was the first study related to teaching discrimination of two wh-questions, there are several limitations. First, it is arguable that the bag that contained the “*What’s that?*” items and the empty box used for the “*Where is it?*” became discriminative stimuli for asking the questions. However, as this was the first study of its kind, the central focus was on demonstrating the results experimentally in a controlled setting. Future replication studies could include generalization trials with different stimuli, settings, and communication partners. For instance, using novel containers for teaching “*What’s that?*” and familiar containers for “*Where is it?*” may help ensure teaching discrimination of the two questions. In terms of the present study, it has been demonstrated that discriminating question-asking skills can be learned. However, it would be beneficial for educators and parents to continue contriving situations for participants to ask “*What’s that?*” and “*Where is it?*” in their natural environments using the prompting procedure. During the study, Joann’s therapeutic support staff worker (TSS) commented that Joann had appropriately asked “*What’s that?*” three times that morning in her classroom. Although anecdotal, this is a very promising comment related to Joann’s ability to generalize one of her question-asking skills.

A second limitation of the current study is that the participants were not matched by age (Maurice, Green, & Luce, 1996). This age discrepancy may explain the difference in the latency of results between Joann and Rita with Henry (it would be helpful to review the current question-asking literature and examine the ages of the participants in



relation to their outcomes). It is not that educators should refrain from teaching younger preschoolers with ASD to ask questions, but that it may be expected that they will take longer than older preschoolers with ASD to master these communicative skills. It is important to remember that children with ASD typically have communication impairments, and their learning may not be parallel to their NT peers, and therefore their learning curve may be significantly slower.

The limited research suggests that language delayed children follow the same sequence in *responding* to wh-questions as NT children, but that they progress at a slower rate (Lee & Ashmore, 1983). Thus it may be possible to suggest that language delayed children (including those with ASD) progress at a slower rate in *expressing* wh-questions too. However, given the results of this study, Henry only required 16 days to complete the study which is a relatively short amount of time, given that he learned two questions, was able to discriminate between them for four consecutive days, and learned eight new vocabulary words.

This study has highlighted areas for future research. The next step in continuing research is to replicate this study and include generalization measures, and investigate whether preschoolers with ASD can ask and discriminate between asking the two questions in applied settings. Furthermore, another study could center on teaching “Where?” and “Who?” a replication of Sundberg and colleagues’ 2002 study, and then “What?” “Where?” and “Who?” together. Experimentally, future researchers should continue teaching wh-questions and discrimination in the sequence that NT children learn. Researchers should use the typical sequence of questions as a guide to designing and teaching future wh-question asking studies and systematically build a body of

research; thereby teaching parallel to NT children (Bloom, Merkin, & Wootten, 1982; Davis, 1932; Fahey, 1942; Meyer & Shane, 1973; Merkin, Wootten, & Bloom, 1980; Miller, 1981; Smith, 1933; Tyack & Ingram, 1976). As children with ASD get older and more proficient in asking questions, the more complex wh-questions such as “*When?*” and “*Why?*” should start to be investigated. However, it is important to ensure that the children with ASD have the pre-requisite skills to learn the more complex questions, such as understanding time (for “*When?*”) and cause and effect (for “*Why?*”). These pre-requisite skills should be assessed prior to teaching.

Future researchers can also continue to investigate the role of establishing operations and the effects on teaching wh-questions, focusing on how to measure EOs. An additional area could be looking at the differences between wanting information about items and simply wanting items for young children with ASD. Furthermore, researchers could also investigate the differences in wh-questions asking responses using highly-preferred, neutral, and non-preferred items.

In sum, this study demonstrated that three preschoolers with ASD were able to discriminate between asking “*What’s that?*” and “*Where is it?*” as well as learn novel vocabulary. This study not only presents a replication of teaching two wh-questions, but also is the first study of its kind to demonstrate successful outcomes for teaching wh-question discrimination. Discrimination of question-asking is a critical skill for individuals with ASD to actively partake in communicative exchanges therefore, it is important to teach beyond wh-questions in isolation. Researchers should further investigate how young children with ASD learn when presented with competing

stimulus-responses and how they establish appropriate expressive discriminative repertoires; measuring rates and accuracy.

The results from this study highlight several implications for teaching wh-questions to young children with ASD such as collecting pre-requisite skill and attending behavior data, and identifying individualized establishing operations to maintain high motivation. Furthermore, future researchers can examine teaching discrimination in generalized settings, and with various people and stimuli. The results from this study present a building block for future wh-question discrimination studies for young children with ASD as part of systematically teaching the wh-questions parallel to their neurotypical peers.

## REFERENCES

- Adamson, L., & Bakeman, R. (1985). Affect and attention: Infants observed with mothers and peers. *Child Development, 56*, 582-593.
- Adamson, L., & Bakeman, R. (1991). The development of shared attention during infancy. In R. Vasta (Ed.), *Annals of child development* (Vol. 8, pp1-41). London: Jessica Kingsley Publishers, Ltd.
- Adamson, L., & Chance, S. E. (1998). Coordinating attention to people, items, and language. In A. M. Wetherby, S. F. Warren, & J. Reichle (Eds.), *Transitions in prelinguistic communication* (Vol. 7, pp.15-37). Baltimore: Paul H. Brookes
- Adamson, L., & McArthur (1995). Joint attention, affect and culture. In C. Moore & P. Dunham (Eds.), *Joint Attention: Its origins and role in development* (pp. 205-222). Hillsdale, NJ: Erlbaum.
- Alpert, C., & Rogers-Warren, A. K. (1985). Communication in autistic persons: Characteristics and intervention. In S. Warren & A. K. Rogers-Warren (Eds.), *Teaching functional language: Generalization and maintenance of language skills* (pp. 123-155). Baltimore: University Park Press.
- American Psychiatric Association. (1994). *Diagnostic and Statistical Manual of Mental Disorders*. (4<sup>th</sup> ed.). Washington, DC: Author.
- Anderson, S. R., Avery, D. L., Dipietro, E. K., Edwards, G.L., & Christian, W. P. (1987). Intensive home-based early intervention with autistic children. *Education and Treatment of Children, 10*, 352-366.
- Bacon, A. L., Fein, D., Morris, R., Waterhouse, L., & Allen, D. (1998). The responses of autistic children to the distress of others. *Journal of Autism and Developmental*

- Disorders*, 28, 129–142.
- Baldwin, D. A. (1995). Understanding the link between joint attention and language. In C. Moore & P. J. Dunham (Eds.), *Joint attention: Its origin and role in development* (pp. 131–158). Hillsdale, NJ: Erlbaum.
- Baltaxe, C. A., & Simmons, J. Q. (1981). Disorders of language in childhood psychosis: current concepts and approaches. In J. Darby (Ed.), *Speech evaluation in psychiatry* (pp. 285–328). New York: Grune and Stratton.
- Baron-Cohen, S. (1989). Perceptual role-taking and protodeclarative pointing in autism. *British Journal of Developmental Psychology*, 7, 113–127.
- Ben-Arieh, J. (2007). *How to use joint attention routines*. Texas: Pro-Ed Series on Autism Spectrum Disorders.
- Blockberger, S. & Sutton, A. (2003). Toward linguistic competence: Language experiences and knowledge of children with extremely limited speech. In J.C. Light, D.R. Beukelman, & J. Reichle's (Eds.), *Communicative competence for individuals who use AAC*. Maryland: Paul H. Brookes.
- Bloom, L., & Lahey, M. (1978). *Language development and language disorders*. New York: John Wiley & Sons.
- Bloom, L., Merkin, S., & Wootten, J. (1982). Wh-questions: Linguistic factors that contribute to the sequence of acquisition. *Child Development*, 53, 1084-1092.
- Bogdashina, O. (2005). *Communication issues in autism and asperger syndrome*. London: Jessica Kingsley Publishers.
- Bono, M. A., Daley, T. C., & Sigman, M. D. (April, 2003). Relations among joint attention, amount of intervention and language gain in early autism. Paper

- presented at the *Biennial Meeting of the Society for Research in Child Development*, Tampa, FL.
- Bregman, J., Zager, D., & Gerdtz, J. (2005). Behavioral interventions. In F. Volkmar, R. Paul, A. Klim, & D. Cohen (Eds.), *Handbook of autism and pervasive developmental disorders* (3<sup>rd</sup> ed., pp. 897–924). Hoboken, NJ: John Wiley.
- Brooks, R., & Meltzoff, A. N. (2002). The importance of eyes: How infants interpret adult looking behavior. *Developmental Psychology*, *38*, 958–966.
- Brown, R. (1968). The development of wh- questions in child speech. *Journal of Verbal Learning and Verbal Behavior*, *7*, 279-290.
- Brown, R. Cazden, C. Bellugi-Klima, U. (1971). The child's grammar from I to III. In A. Bar-Adon (Ed.), *Child language*. Englewood Cliffs, N. J: Prentice-Hall.
- Bruinsma, Y., Koegel, R. L., & Koegel, L. K. (2004). Joint attention and children with autism: A review of the literature. *Mental Retardation and Developmental Disabilities*, *10*, 169-175.
- Bruner, J. (1983). *Child's talk: Learning to use language* (pp. 65–88). New York: Norton.
- Butterworth, G., & Jarrett, N. (1991). What minds have in common is space: Spatial mechanisms serving joint visual attention in infancy. *British Journal of Developmental Psychology*, *9*, 55–72.
- Cafiero, J. M. (2005). *Meaningful exchanges for people with autism*. Maryland: Woodbine House.
- Capps, L., Kehres, J., & Sigman, M. (1998). Conversational abilities among children with autism and children with developmental delays. *Autism: The International*

- Journal of Research and Practice*, 2, 325-344.
- Carnine, D. W., Silbert, J., Kame'enui, E. J., & Tarver, S. G. (2004). *Direct instruction reading*. New Jersey: Pearson.
- Carpenter, M., Nagell, K., & Tomasello, M. (1998). Social cognition, joint attention, and communicative competence from 9 to 15 months of age. *Monographs of the Society for Research in Child Development*, 63(4, Serial No. 255), 1–143.
- Carr, E. (1982). Sign language. In R. Koegel, A. Rincover, & A. Egel (Eds.), *Educating and understanding autistic children* (pp. 142-157). San Diego, CA: College Hill Press.
- Carr, E. G., & Durand, V. M. (1985). Reducing behavior problems through functional communication training. *Journal of Applied Behavior Analysis*, 18, 111-126.
- Charlop, M. H., & Trasowech, J. (1991). Increasing children's daily spontaneous speech. *Journal of Applied Behavior Analysis*, 24, 747-761.
- Charman, T. (1998). Specifying the nature and course of the joint attention impairment in autism in the pre-school years: Implications for diagnosis and intervention. *Autism: The International Journal of Research and Practice*, 2, 61–79.
- Charman, T., Baron-Cohen, S., Swettenham, J., Baird, G., Drew, A., & Cox, A. (2003). Predicting language outcomes in infants with autism and pervasive developmental disorders. *International Journal of Language and Communication Disorders*, 38, 265–285.
- Charman, T., Swettenham, J., Baron-Cohen, S., Cox, A., Baird, G., & Drew, A. (1998). An experimental investigation of social-cognitive abilities in infants with autism: Clinical implications. *Infant Mental Health Journal*, 19, 260–275.

- Cipani, E. (2008). *Triumphs in early autism treatment*. New York: Springer Publishing Company.
- Cipani, E., & Spooner, F. (1997). Treating problem behaviors maintained by negative reinforcement. *Research in Developmental Disabilities, 18*, 329-42.
- Cooley, R. E., & Roach, D. A. (1984). A conceptual framework. In R. Bostrom (Ed.), *Competence in communication. A multidisciplinary approach*. Beverly Hills: Sage Publications.
- Cooper, J. O., Heron, T. E., & Heward, W. L. (2007). *Applied behavior analysis*. New Jersey: Pearson Education.
- Curcio, F. (1978). Sensorimotor functioning and communication in mute autistic children. *Journal of Autism and Child Schizophrenia, 8*, 281–282.
- Curcio, F., & Paccia, J. (1987). Conversation with autistic children: Contingent relationship between features of adult input and children's response adequacy. *Journal of Autism and Developmental Disabilities, 17*, 81–93.
- Dawson, G. (1988). Cerebral lateralization in autism: Clues to its role in language and affective development. In S. Segalowitz & D. Molfese (Eds.), *Developmental implications of brain lateralization* (pp. 437-461). New York: Guilford.
- Davis, E. (1932). The form and functions of children's questions. *Child Development, 3*, 57-74.
- Dawson, G., Meltzoff, A., Osterling, J., & Rinaldi, J. (1998). Neuropsychological correlates of early autistic symptoms. *Child Development, 69*, 1247–1482.
- Dawson, G., Toth, K., Abbott, R., Osterling, J., Munson, J., Estes, A., & Liaw, J. (2004). Early social attention impairments in autism: Social orienting, joint attention, and



- attention to distress. *Developmental Psychology*, 40, 271–283.
- Delprato, D. (2001). Comparison of discrete trial and normalized behavioral language intervention for young children with autism. *Journal of Autism and Developmental Disabilities*, 31, 315-325.
- Dilavore, P., & Lord, C. (April, 1995). Do you see what I see? Requesting and joint attention in young autistic children. Paper presented at the *Conference for the Society of Research in Child Development*, Indianapolis, IN.
- Doehring, P., Benaroya, S., Klaiman, C., & Scuccimarri, C. (April, 1995). Using joint attention, play and imitation skills in the differential diagnosis of young children with autism and with developmental disorders. Paper presented at the *Conference of the Society for Research in Child Development*, Indianapolis, IN.
- Esbenshade, P. H., & Rosales-Ruiz, J. (2001). Programming common stimuli to promote generalized question-asking. *Journal of Positive Behavior Interventions*, 3, 199-210.
- Fahey, G. L. (1942). The questioning activity of children. *Journal of Genetic Psychology*, 60, 337-357.
- Ferster, C. B., & DeMyer, M. K. (1961). The development of performances in autistic children in an automatically controlled environment. *Journal of Chronic Diseases*, 13, 312–345.
- Foster, S. L., & Mash, E. J. (1999). Assessing social validity in clinical treatment research issues and procedures. *Journal of Consulting and Clinical Psychology*, 67, 309-319.
- Freed, B. D., Marshall, R. C., & Frazier, K. E. (1997). Long-term effectiveness of

- PROMPT treatment in a severely apractic-aphasic speaker. *Aphasiology*, *11*, 365-372.
- Gallagher, T. M., & Darnton, B. A. (1978). Conversational aspects of the speech of language-disordered children: Revision behaviors. *Journal of Speech and Hearing Research*; *21*, 118-135.
- Gernsbacher, M. (June, 2002). A case study in autism and apraxia. Paper presented at the *Symposium for Research in Child Language Disorders*, Madison, WI.
- Goldstein, H. (2002). Communication intervention for children with autism: A review of treatment efficacy. *Journal of Autism and Developmental Disorders*, *32*, 373-396.
- Harris, S. L., Handleman, J. S., Arnold, M., & Gordon, M. (2000). The Douglass Developmental Disabilities Center: Two models of service delivery. In J. Handleman and S. Harris (Eds.), *Preschool education programs for children with autism*. Austin, TX: ProEd.
- Hart, B. M., & Risley, T. R. (1968). Establishing use of descriptive adjectives in the spontaneous speech of disadvantaged preschool children. *Journal of Applied Behavior Analysis*, *1*, 109-120.
- Hart, B. M., & Risley, T. R. (1975). Incidental teaching of language in the preschool. *Journal of Applied Behavior Analysis*, *8*, 411-420.
- Hayden-Chumpelik, D. (1984). The PROMPT system of therapy: Theoretical frameworks and applications for developmental apraxia of speech. *Seminars in Speech and Language*, *5*, 139-156.
- Hayden-Chumpelik, D. (2006). The PROMPT model: Use and application for children with discrimination phonological-motor impairment. *Advances in Speech*

- Language Pathology*, 8, 265-281.
- Hewett, F. (1965). Teaching speech to an autistic child through operant conditioning. *American Journal of Orthophysicsiatry*, 35, 927-936.
- Hoag, L. A., Bedrosian, J. L., Johnson, D. E., & Molineux, B. (1994). Variables affecting perceptions of social aspects of the communicative competence of an adult AAC user. *Augmentative and Alternative Communication*, 10, 129-137.
- Hood, L. A. (1977). *A longitudinal study of the development of the expression of causal relations in complex sentences*. Unpublished doctoral dissertation, Columbia University.
- Horner, R. H., Carr, E. G., Strain, P. S., Todd, A. W., & Reed, H. K. (2002). Problem behavior interventions for young children with autism: A research synthesis. *Journal of Autism and Developmental Disorders*, 32, 423–446.
- Howlin, P., Mawhood, L., & Rutter, M. (2000). Autism and developmental receptive language disorder- a follow-up comparison in early adult life. II: Social, behavioral, and psychiatric outcomes. *Journal of Child Psychology & Psychiatry*, 41, 561-578.
- Hung, D.W. (1977). Generalization of “curiosity” questioning behavior in autistic children. *Journal of Behavior Therapy and Experimental Psychiatry*, 8, 237-245.
- Jahr, E. (2001). Teaching children with autism to answer novel wh-questions by utilizing a multiple exemplar strategy. *Research in Developmental Disabilities*, 22, 407-423.
- Jensen, V. K., & Sinclair, L. V. (2002). Treatment of autism in young children: Behavioral interventional and applied behavior analysis. *Infants and Young*

- Children, 14, 42-52.*
- Jones, E. A., & Carr, E. G. (2004). Joint attention in children with autism: Theory and intervention. *Focus on Autism and Other Developmental Disabilities, 19*(1), 13-26.
- Jones, E. A., Carr, E. G., & Feeley, K. M. (2006). Multiple effects of joint attention intervention for children with autism. *Behavior Modification, 30*, 782-834.
- Jordan, R., & Jones, G. (1999). *Meeting the needs of children with autism spectrum disorders*. Lonson: David Fulton.
- Kaiser, A., Yoder, P. J., & Keetz, A. (1992). Evaluating milieu teaching. In S. Warren & J. Reichle (Eds.), *Causes and effects in communication and language intervention*. Baltimore: Paul H. Brookes.
- Kasari, C., Freeman, S. F. N., & Paparella, T. (May, 2004). Prediction to one year follow-up from targeted joint attention and play interventions in young children with autism. Poster presented at the *Annual International Meeting for Autism Research*, Sacramento, CA.
- Kazdin, A. E. (1982). *Single-case research designs*. New York: Oxford
- Kazdin, A. E., & Weisz, J. R. (2003). *Evidence-based psychotherapies for children and adolescents*. New York, NY: Guilford Press.
- Kennedy, C. H. (2005). *Single-case designs for educational research*. Boston: Pearson.
- Kitchen, T. P (2005). Error Correction. In J. T. Neisworth & P. S. Wolfe's (Eds.), *The autism encyclopedia*. Baltimore: Paul H. Brookes.
- Knapczyk, D. R., & Livingston, G. (1974). The effects of prompting question-asking upon on-task behavior and reading comprehension. *Journal of Applied Behavior*

- Analysis*, 7, 115-121.
- Koegel, L. K. (2000). Interventions to facilitate communication in autism. *Journal of Autism and Developmental Disorders*, 30, 383-391.
- Koegel, L. K., Camarata, S.M., Valdez-Menchaca, & Koegel, R. L. (1998a). Setting generalization of question-asking by children with autism. *American Journal on Mental Retardation*, 102, 346-357.
- Koegel, L. K., Carter, C. M., & Koegel, R. L. (2003). Teaching children with autism self-initiations as a pivotal response. *Topics in Language Disorders*, 23, 134-145.
- Koegel, R. L., & Koegel, L. K. (1995). *Teaching children with autism: Strategies for initiating positive interactions and improving learning opportunities*. Baltimore, MD: Paul H. Brookes.
- Koegel, L. K., Koegel, R. L., & Carter, C. M. (1998b). Pivotal responses and the natural language teaching paradigm. *Seminars in Speech and Language*, 19, 355-371.
- Koegel, L. K., Koegel, R. L., Harrower, J., & Carter, C. M. (1999). Pivotal response intervention: I. Overview of approach. *Journal of the Association for Persons with Severe Handicaps*, 24, 174-186.
- Koegel, R. L., Koegel, L. K. & Surratt, A. (1992). Language intervention and disruptive behavior in preschool children with autism. *Journal of Autism and Developmental Disorders*, 22, 141-153.
- Koegel, R. L., & Mentis, M. (1985). Motivation in childhood autism. Can they or won't they? *Journal of Child Psychology and Psychiatry*, 26, 185-191.
- Koegel, R. L., O'Dell, M., & Koegel, L. K. (1987). A natural language teaching paradigm for non verbal autistic children. *Journal of Autism and Developmental Disorders*

- Disorders, 17, 187-200.*
- Koegel, R. L., Schreibmen, L., Good, A., Cerniglia, L., Murphy, C., & Koegel, L. K. (1998c). *How to teach pivotal behaviors to children with autism: A training manual*. Santa Barbara, CA: University of California, Santa Barbara, Dept. of Speech and Hearing Sciences,
- Krantz, P., Zalski, S., Hall, L., Fenske, E., & McClannahan, L. (1981). Teaching complex language to autistic children. *Analysis and Intervention in Developmental Disabilities, 1, 259-297.*
- Laski, K. E., Charlop, M. H., & Schreibman, L. (1988). Training parents to use the natural language paradigm to increase their autistic children's speech. *Journal of Applied Behavior Analysis, 21, 391-400.*
- Landry, S. H., & Loveland, K. A. (1988). Communication behaviors in autism and developmental language delay. *Journal of Child Psychology and Psychiatry, 29, 621-634.*
- Lee, R. F., & Ashmore, L. L. (1983). Receptive and expressive wh-question performance by language-delayed children. *Journal of Communication Disorders, 16, 99-109.*
- Light, J. C. (1988). Interactions involving individuals using augmentative and alternative communication systems: State of the art and future directions for research. *Augmentative and Alternative Communication, 5, 137-143.*
- Light, J. C. (1989). Toward a definition of communicative competence for individuals using augmentative and alternative communication systems. *Augmentative and Alternative Communication, 5, 137-144.*
- Light, J. C. (2003). Shattering the silence: Development of communicative competence

- by individuals who use AAC. In J. C. Light, D. R. Beukelman, & J. Reichle's (Eds.), *Communicative competence for individuals who use AAC*. Baltimore: Paul H. Brookes.
- Light, J. C., & Binger, C. (1998). *Building communicative competence with individuals who use augmentative and alternative communication*. Baltimore: Paul H. Brookes.
- Lord, C. (1986). Contribution of behavioral approaches to the language and communication of persons with autism. In E. Schopler & G. Mesibov (Eds.), *Communication problems in autism* (pp. 59-68). New York: Plenum Press.
- Lord, C., Risi, S., & Pickles, A. (2004). Trajectory of language development in autistic spectrum disorders. In M. L. Rice, & S. F. Warren's (Eds.), *Developmental language disorders: From phenotypes to etiologies*. Mahwah, NJ: Erlbaum.
- Lovaas, O. I. (1977). *The autistic child: Language development through behavior modification*. New York: Irving Publishers.
- Lovaas, O. I. (1987). Behavioral treatment and normal educational and intellectual functioning in young autistic children. *Journal of Consulting and Clinical Psychology, 55*, 3-9.
- Lovaas, O. I., Schaeffer, B., & Simmons, J. Q. (1965). Building social behavior in autistic children by use of electric shock. *Journal of Experimental Research in Personality, 1*, 99-109.
- Love, S. R., Matson, J. L., & West, D. C. (1990). Mothers as effective therapists for autistic children's phobias. *Journal of Applied Behavior Analysis, 23*, 379-385.
- Loveland, K. A., & Landry, S. H. (1986). Joint attention and language in autism and

- developmental language delay. *Journal of Autism and Developmental Disorders*, *16*, 335–349.
- Marshall, G. R. (1966). Toilet training of an autistic eight-year-old through operant conditioning therapy: A case report. *Behavior Research and Therapy*, *4*, 242–245.
- Marshall, N. R., & Hegrenes, J. R. (1970). Programmed communication therapy for autistic mentally retarded children. *Journal of Speech and Hearing Disorders*, *35*, 70–83.
- Matson, J. L., Benavidez, D. A., Compton, L. S., Paclawskyj, T., & Baglio, C. (1996). Behavioral treatment of autistic persons: A review of research from 1980 to the present. *Research in Developmental Disabilities*, *17*, 433–465.
- Matson, J. L., Sevin, J. A., Box, M., Francis, K., & Sevin, B. (1993). An evaluation of two methods for increasing self-initiated verbalization in autistic children. *Journal of Applied Behavior Analysis*, *26*, 389–398.
- Matson, J. L., Sevin, J. A., Fridley, D., & Love, S. R. (1990a). Increasing spontaneous language in three autistic children. *Journal of Applied Behavior Analysis*, *23*, 227–233.
- Matson, J. L., & Smith, K.R. M. (2008). Current status of intensive behavioral interventions for young children with PDD-NOS. *Research in Autism Spectrum Disorders*, *2*, 60–74.
- Matson, J. L., Taras, M. E., Sevin, J. A., Love, S. R., & Fridley, D. (1990b). Teaching self-help skills to autistic and mentally retarded children. *Research in Developmental Disabilities*, *11*, 361–378.



- Maurice, C., Green, G., & Luce, S. (1996). *Behavior intervention for young children with autism: A manual for parents and professionals*. Austin, TX: Pro-Ed.
- Meyer, W. J. & Shane, S. (1973). The form and function of children's questions. *The Journal of Genetic Psychology*, 123, 285-296.
- McConnell, O. L. (1967). Control of eye contact in an autistic child. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 8, 249-255.
- McEachin, J. T., Smith, T., Groen, A. D., & Wynn, J. W. (2000). Randomized trial of intensive early intervention for children with pervasive developmental disorder. *American Journal on Mental Retardation*, 105, 269-285.
- McEvoy, R., Rogers, S., & Pennington, R. (1993). Executive function and social communication deficits in young, autistic children. *Journal of Child Psychology and Psychiatry*, 34, 563-578.
- McGee, G. G., Krantz, P. J., Mason, D., & McClannahan, L. E. (1983). A modified incidental teaching procedure for autistic youth: Acquisition and generalization of receptive item labels. *Journal of Applied Behavior Analysis*, 16, 329-338.
- McGee, G. G., Morrier, M. J., & Daly, T. (1999) An incidental teaching approach to early intervention for toddlers with autism. *Journal of the Association for Persons of Severe Handicaps*, 24, 133-146.
- Merkin, S., Wooten, J., & Bloom, L. (1980). Discourse Factors in the Acquisition of Wh-Questions. *Papers and reports on child language development, number 19*.
- Mesibov, G. B., Adams, L. W., & Klinger, L. G. (1997). *Autism: understanding the disorder*. New York: Plenum Press.
- Michael, J. (1982). Distinguishing between discriminative and motivational functions of

- stimuli. *Journal of the Experimental Analysis of Behavior*, 37, 149-155.
- Michael, J. (1988). Establishing operations and the mand. *The Analysis of Verbal Behavior*, 6, 3-9.
- Michael, J. (1993). Establishing operations. *The Behavior Analyst*, 16, 191-206.
- Michael, J. (2000). Implications and refinements of the establishing operation concept. *Journal of Applied Behavior Analysis*, 33, 401-410.
- Miller, J. F. (1981). *Assessing language production in children*. Baltimore: University Park Press.
- Mirenda, P., & Santogrossi, J. (1985). A prompt-free strategy to teach pictorial communication system use. *Augmentative and Alternative Communication*, 1, 143-150.
- Moore, B. J., & Bailey, J. S. (1973). Social punishment in the modification of a preschool child's "autistic like" behavior with a mother as therapist. *Journal of Applied Behavior Analysis*, 6, 497-507.
- Moore, C., & Dunham, P. (1995). *Joint attention: Its origins and role in development*. Hillsdale, NJ: Erlbaum.
- Morales, M., Mundy, P., & Rojas, J. (1998). Brief report: Following the direction of gaze and language development in 6-month-olds. *Infant Behavior & Development*, 21, 373-377.
- Mundy, P. (1995). Joint attention and social-emotional approach in children with autism. *Development and Psychopathology*, 7, 63-82.
- Mundy, P., & Crowson, M. (1997). Joint attention and early social communication: Implications for research on intervention with autism. *Journal of Autism and*

- Developmental Disorders*, 27, 653-676.
- Mundy, P., & Sigman, M. (1989a). Specifying the nature of the social impairment in autism. In G. Dawson (Ed.), *Autism* (pp. 3-21). New York: Guilford.
- Mundy, P., & Sigman, M. (1989b). The theoretical implications of joint attention deficits in autism. *Development and Psychopathology*, 1, 173-183.
- Mundy, P., Sigman, M., & Kasari, C. (1990). A longitudinal study of joint attention and language development in autistic children. *Journal of Autism and Developmental Disorders*, 20, 115-128.
- Mundy, P., Sigman, M., Ungerer, J., & Sherman, T. (1986). Defining the social deficits of autism: The contribution of non-verbal communication measures. *Journal of Child Psychology and Psychiatry*, 27, 657-669.
- Mundy, P., Sigman, M., Ungerer, J., & Sherman, T. (1987). Nonverbal communication and play correlates of language development in autistic children. *Journal of Autism and Developmental Disorders*, 17, 349-364.
- Neisworth, J. T., & Wolfe, P. S. (2005). *The autism encyclopedia*. Baltimore: Paul H. Brookes Publishing Company.
- Nelson, K. (1973). Structure and strategy in learning to talk. *Monographs of the Society for Research in Child Development*, Serial 149, 38, 1-2.
- New York State Department of Health (1999). *Report of Recommendations: Autism/Pervasive Developmental Disorders*. New York State Department of Health Early Intervention Program.
- Ostryn, C. (in preparation). Teaching preschool children with autism to ask "where is it?" To be submitted to *Journal of Applied Behavior Analysis*.

- Ostryn, C., & Wolfe, P. S. (under review). Teaching preschool non-vocal children with autism to ask “what’s that?” using an alternative and augmentation picture communication system. Submitted to *Journal of Applied Behavior Analysis*.
- Ostryn, C., Wolfe, P. S., & Rusch, F. R. (2008). A review and analysis of the picture exchange communication system (PECS) for individuals with autism spectrum disorders using a paradigm of communication competence. *Research and Practice for Persons with Severe Disabilities*, 33, 13-24.
- Parnell, M., & Amerman, J. (1984). Answers to wh questions: Research and application. In T. Gallagher, & C. A. Prutting (Eds.), *Pragmatic assessment and intervention issues in language*. San Diego, CA: College Hill Press.
- Parnell, M. Patterson, S., & Harding, M. (1984). Answers to wh-questions: A developmental study. *Journal of Speech and Hearing Research*, 27, 297-305.
- Paul, L. (1985). Programming peer support for functional language. In S. F. Warren, & A. K. Rogers-Warren (Eds.), *Teaching functional language: Generalization and maintenance of language skills* (pp. 289-307). Baltimore: University Park Press.
- Paul, R., & Sutherland, D. (2005). Enhancing early language in children with autism spectrum disorders. In F. R. Volkmar, R. Paul, A. Klin, & D. Cohen (Eds.), *Handbook of autism and pervasive developmental disorders* (pp. 882- 924). Hoboken, New Jersey: John Wiley & Sons.
- Peeters, T., & Gillberg, C. (1999). *Autism: Medical and educational aspects*. London: Whurr.
- Prelock, P. A. (2007). *Autism spectrum disorders: Issues in assessment and intervention*. Texas; ProEd.

- Public Health Service (2008). Other mental disorders in children and adolescents.  
Retrieved from <http://www.surgeongeneral.gov/library/mentalhealth/chapter3/sec6.html>
- Raghavendra, P., Bornman, J., Granlund, M., & Björck-Åkesson, E. (2007). The World Health Organization's international classification of functioning, disability, and health: Implications for clinical and research practice in the field of augmentative and alternative communication. *Augmentative and alternative communication*.  
Retrieved from <http://www.informaworld.com/smpp/title~content=t713692248>.
- Reichle, J., & Sigafoos, J. (1991). Bringing communicative behavior under the control of appropriate stimuli. In J. Reichle, J. York, & J. Sigafoos (Eds.), *Implementing augmentative and alternative communication*. Maryland: Paul H. Brookes.
- Risley, T. R., & Wolf, M. M. (1967). Establishment of functional speech in echolalic children. *Behavior Research and Therapy*, 5, 73–88.
- Ritvo, E., & Freeman, B. J. (1978). National Society for Autistic Children definition of the syndrome of autism. *Journal of Autism and Childhood Schizophrenia*, 8, 162-167.
- Rogers, S. (2006). Evidence-based interventions for language development in young children with autism. In T. Charman & W. Stone (Eds.), *Social communication development in autism spectrum disorders* (pp. 143-179). New York: Guilford Press.
- Rogers, S., Hall, T., Osaki, D., Reaven, J., & Herbison, J. (2000). A comprehensive, integrated, educational approach to young children with autism and their families. In J. Handleman and S. Harris (Eds.), *Preschool education programs for*

- children with autism*. Austin, TX: ProEd.
- Rogers, S. J., & Hepburn, S. L. (April, 2003). Individual variability and predictors of preschool language outcomes in autism. Paper presented at the *Biennial Meeting of the Society for Research in Child Development*, Tampa, FL.
- Rogers-Warren, A., & Warren, S. (1980). Mand for verbalization: Facilitating the generalization of newly trained language in children. *Behavior Modification*, 4, 230-245.
- Rogow, S. (1978). On the comprehension of questions by nonspeaking children. *Journal of Communication Disorders*, 11, 383-390.
- Rollins, P. R. (1994). *A case study of the development of language and communicative skills for six children with autism*. Unpublished doctoral dissertation, Harvard Graduate School of Education, Cambridge, MA.
- Rollins, P. R., Bay, K. S., & Aires, L. H. (November, 1996). *Understanding form function relationships in children with autistic spectrum disorders*. Poster presented at *The American Speech and Hearing Association Annual Convention*, Seattle, WA.
- Rollins, P. R., & Snow, C. E. (1998). Shared attention and grammatical skills in typical children and children with autism. *Journal of Child Language*, 25, 653-673.
- Rollins, P. R., Wambacq, I., Dowell, D., Mathews, L., & Britton Reese, P. (1998). An intervention technique for children with autistic spectrum disorder: Joint attentional routines. *Journal of Communication Disorders*, 31, 181-193.
- Rosales-Ruiz, J., & Baer, D. M. (1997). Behavioral cusps: A developmental and pragmatic concept for behavior analysis. *Journal of Applied Behavior Analysis*,

- 30, 533-544.
- Ross, D. E., & Greer, R. D. (2003). Generalized imitation and the mand: inducing first instances of speech in young children with autism. *Research in Developmental Disabilities, 24*, 58-74.
- Schopler, E., & Mesibov, G. B. (1986a). Introduction to communication problems in autism. In E. Schopler & G. B. Mesibov (Eds.), *Communication problems in autism* (pp. 3-13). New York: Plenum Press.
- Schopler, E., & Mesibov, G. B. (1986b). *Social behavior in autism*. New York: Basic Books.
- Schopler, E., & Olley, G. (1982). Comprehensive educational services for autistic children. In C. Reynolds & T. Gutkin (Eds.), *Handbook of school psychology*. New York: Wiley & Sons.
- Schopler, E., & Reichler, R. J. (1971). Parents as cotherapists in the treatment of psychotic children. *Journal of Autism and Childhood Schizophrenia, 1*, 87-102.
- Schreibman, L. (2000). Intensive behavioral/psychoeducational treatments for autism. *Journal of Autism and Developmental Disorders, 30*, 373-378.
- Schreibman, L., & Ingersoll, B. (2005). Behavioral interventions to promote learning in individuals with autism. In F. R. Volkmar, R. Paul, A. Klin, & D. Cohen (Eds.), *Handbook of autism and pervasive developmental disorders* (3<sup>rd</sup> ed., pp. 882-924). Hoboken, New Jersey: John Wiley & Sons.
- Schuler, A. L. (1980). Teaching functional language. In B. Wilcox, & A. Thompson (Eds.), *Critical issues in the education of autistic children* (pp. 154-178). Washington, DC: U.S. Department of Education, Office of Special Education.

- Scott, J., Clark, C. & Brady, M. (2000). *Students with autism*. San Diego, CA: Singular Publishing.
- Secan, K. E., Egel, A. L., & Tilley, C. S. (1989). Acquisition, generalization, and maintenance of question-answering skills in autistic children. *Journal of Applied Behavior Analysis, 22*, 181-196.
- Sigman, M., Kasari, C., Kwon, J., & Yirmiya, N. (1992). Responses to the negative emotions of others by autistic, mentally retarded, and normal children. *Child Development, 63*, 796–807.
- Sigman, M., & Ruskin, E. (1999). Continuity and change in the social competence of children with autism, Down syndrome, and developmental delays. *Monographs of the Society for Research in Child Development, 64*(Serial No. 256).
- Skinner, B. F. (1957). *Verbal behavior*. New York: Appleton-Century-Crofts.
- Skinner, B. F. (1974). *About behaviorism*. New York: Vintage Books.
- Smith, M. (1933). The influence of age, sex and situation on the frequency, form, and function of questions asked by preschool children. *Child Development, 4*, 201-213.
- Smith, T., Buch, G. A., Gamby, T. E. (2000). Parent-directed, intensive early intervention for children with pervasive developmental disorder. *Research in Developmental Disabilities, 21*, 297-309.
- Smith, T., Donahue, P., & Davis, B. (2000). The UCLA Young Autism Project. In J. Handleman and S. Harris (Eds.), *Preschool education programs for children with autism*. Austin, TX: ProEd.
- Square-Storer, P., & Chumpelik Hayden, D. (1989). PROMPT treatment. In P. Square-



- Storer (Ed.), *Acquired apraxia of speech in apraxia adults: Theoretical and clinical issues*. London: Erlbaum.
- Stokes, T. F., & Baer, D. M. (1977). An implicit technology of generalization. *Journal of Applied Behavior Analysis, 10*, 349-368.
- Strain, P. S., & Hoyson, M. (2000). The need for longitudinal, intensive social skills interventions: LEAP follow-up outcomes for children with autism. *Topics in Early Childhood Special Education, 20*, 116-122.
- Striefel, S. (1974). *Behavior modification.: Teaching a child to imitate*. Austin, TX: Pro-Ed.
- Stone, W. L., Ousley, O. Y., Yoder, P. J., Hogan, K. L., & Hepburn, S. L. (1997). Nonverbal communication in very young children. *Journal of Autism and Developmental Disorders, 27*, 677-696. .
- Sulzer-Azaroff, B. & Mayer, G. (1996). *Achieving educational excellence*. New York: Holt, Rinehart, and Winston.
- Sundberg, M. L., Loeb, M., Hale, L., & Eigenheer, P. (2002). Contriving establishing operations to teach mands for information. *The Analysis of Verbal Behavior, 18*, 15-29.
- Sundberg, M. L. & Michael, J. (2001). The value of Skinner's analysis of verbal behavior for teaching children with autism. *Behavior Modification, 25*, 698-724.
- Taylor, B. A., & Harris, S. L., (1995). Teaching children with autism to seek information: Acquisition of novel information and generalization of responding. *Journal of Applied Behavior Analysis, 28*, 3-14.
- Terence, H. S. (1963). Discrimination learning with and without "errors." *Journal of the*

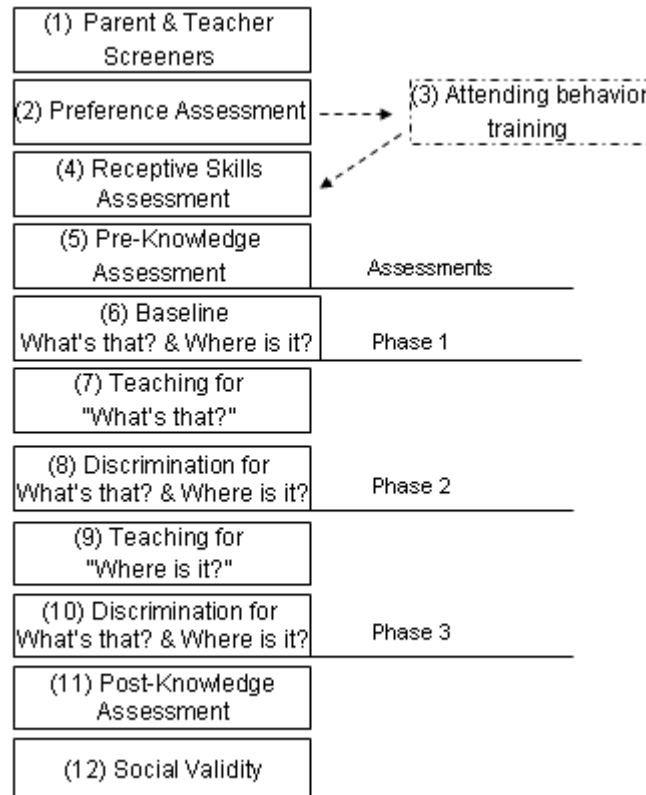
- Experimental Analysis of Behavior*, 6, 1-27.
- Toth, K., Dawson, G., Munson, J., Estes, A., & Abbott, R. (April, 2003). Role of joint attention, social interaction, and play in language and social growth in young children with autism. Paper presented at the *Biennial Meeting of the Society for Research in Child Development*, Tampa, FL.
- Toth, K., Munson, J., Meltzoff, A. N., & Dawson, G. (2006). Early predictors of communication development in young children with autism spectrum disorder: Joint attention, imitation, and toy play. *Journal of Autism and Developmental Disorders*, 36, 993-1005.
- Trantham, C. R., & Pederson, J. K. (1976). *Normal language development*. Baltimore: Williams and Wilkins.
- Tsiouri, I., & Greer, R. D. (2003). Inducing vocal behavior in children with severe language delays through rapid motor imitation responding. *Journal of Behavioral Education*, 12, 185-206.
- Twardosz, S., & Baer, D. M. (1973). Training two severely retarded adolescents to ask questions. *Journal of Applied Behavior Analysis*, 6, 655-661.
- Tyack, D., & Ingram, D. (1976). Children's production and comprehension of questions. *Journal of Child Language*, 4, 211-224.
- Venter, A., Lord, C., & Schopler, E. (1992). A follow-up study of high-functioning autistic children. *Journal of Child Psychology and Psychiatry*, 33, 489-507.
- Vicker, B. (2006). Wh question comprehension and students with autism spectrum disorder. *Perspectives on School-Based Issues*, 7, 16-19.
- Volkmar, F. R., Paul, R., Klin, A., & Cohen, D. (2005). *Handbook of autism and*

- pervasive developmental disorders, Volume 2*. New York: John Wiley & Sons.
- Wetherby, A. M. (1986). Ontogeny of communicative functions in autism. *Journal of Autism and Developmental Disorders, 16*, 295-316.
- Wetherby, A. M., Yonclas, D. G., & Bryan, A. A. (1989). Communicative profiles of preschool children with handicaps: Implications for early identification. *Journal of Speech and Hearing Disorders, 54*, 148–158.
- Whalen, C., Schreibman, L., & Ingersoll, B. (2006). The collateral effects of joint attention training on social initiations, positive affect, imitation, and spontaneous speech for young children with autism. *Journal of Autism and Developmental Disorders, 36*, 655-664.
- Wilcox, M. J. & Leonard, L. B. (1978). Experimental acquisition of wh-questions in language-disordered children. *Journal of Speech and Hearing Research, 21*, 220-39.
- Williams, G., Donley, C. R., & Keller, J. W. (2000). Teaching children with autism to ask questions about hidden items. *Journal of Applied Behavior Analysis, 33*, 627-630.
- Williams, G., Perez-Gonzalez, L. A., & Vogt, K. (2003). The role of specific consequences in the maintenance of three types of questions. *Journal of Applied Behavior Analysis, 36*, 285-296.
- Wolf, M., Risley, T., & Mees, H. (1963). Application of operant conditioning procedures to the behavior problems of an autistic child. *Behavior Research and Therapy, 1*, 305–312.
- Wolfe, P., & Neisworth, J. (2005). Autism and applied behavior analysis. *Exceptionality*,

- 13, 1–2.
- Wong, C. S., Kasari, C., Freeman, S., & Paparella, T. (2007). The acquisition and generalization of joint attention and symbolic play skills in young children with autism. *Research and Practice for Persons with Severe Disabilities, 32*, 101-109.
- Woods, J. J., & Wetherby, A. (2003). Early identification and intervention for infants and toddlers who are at risk for autism spectrum disorders. *Language, Speech and Hearing Services in the School, 34*, 180-193.
- Yoder, P. J., & Layton, T. (1988). Speech following sign language training in autistic children with minimal verbal language. *Journal of Autism and developmental Disorders, 18*, 217-229.
- Zambolin, K., Fabrizio, M. A., & Isley, S. (2004). Teaching a child with autism to answer informational questions using precision teaching. *Journal of Precision Teaching and celebration, 20*, 22-25.

## APPENDIX A

### Study Procedures



## APPENDIX B

### Informed Consent

#### INFORMED CONSENT FORM FOR SOCIAL SCIENCE RESEARCH

The Pennsylvania State University

**Title of Project:** TEACHING “WHAT’S THAT?” AND “WHERE IS IT?” TO PRESCHOOL CHILDREN WITH AUTISM SPECTRUM DISORDERS

**Principal Investigator:**

**Cheryl Ostryn**

Department of Educational Psychology, School Psychology and Special Education, 122 CEDAR Building  
Penn State University, University Park, PA 16802  
EMAIL: cuo112@psu.edu  
TELEPHONE: 814- 933 -7008

1. **Purpose:** The purpose of this research is to examine the effects of teaching the question “What’s that?” and “Where is it?” for young children with autism spectrum disorders.
2. **Procedures to be Followed:** The researcher will conduct the study in the following way:

You (parent) will be asked a few short questions about how your child typically communicates during the day and your child’s favorite items.

After consent has been obtained, the study will begin. Twenty trials per child per day will take place. A trial is presenting your child with one toy and recording whether they ask “What’s that?” and hiding a toy and recording whether they ask “Where is it?” The intervention will last for 25 weekdays, with each session of 20 trials lasting between 5-15 minutes. At the start of the study, Cheryl will present your child with a toy in a bag for him/her to ask “What’s that?” Your child’s responses will be recorded. Then Cheryl will teach your child to ask “What’s that?” using a prompting teaching method including prompts, which means that Cheryl will directly help your child always perform correctly. These prompts will be verbal in order for them to ask “What’s that?” in response to being presented with an unknown toy in an opaque bag. Your child will have the opportunity to play with the item (toy) for 20 seconds after the question has been asked. Then Cheryl will present your child with a toy and then hide it so s/he can’t see it so s/he can ask “Where is it?” Your child’s responses will be recorded. Then Cheryl will teach your child to ask “Where is it?” using a prompting teaching method

- including prompts, which means that Cheryl will directly help your child always perform correctly. These prompts will be verbal prompts, in order for them to ask “Where is it?” in response to a hidden toy. Your child will have the opportunity to play with the item (toy) for 20 seconds after the question has been asked. Cheryl will also conduct trials with different toys, containers and in different settings for generalization purposes, Each session will be videotaped for coding. Your child will receive a gift (toy) at the end of the study.
3. **Discomforts and Risks:** The principal researcher Cheryl will come to your child’s classroom everyday for five days for 20 minutes, prior to the study, to get to know your child. During this time, they will play/ read together so your child feels comfortable around Cheryl, and there will be talk about how fun it will be for them to be involved in the “game” (study) in which they will get to play with new toys. There will be no more risk to your child than what s/he experiences in their day at Easter Seals. Your child’s behaviors will be monitored by the principal investigator who has 12 years experience in behavior therapy working with young children with autism spectrum disorders. The principal investigator will stop the experiment when the child exhibits his/her way of saying “I’m done” or “no more.”
  4. **Benefits:** Your child might learn how to ask “What’s that?” and “Where is it?” Your child may also learn new words in response to their asking, and help your child’s vocabulary grow. One of the aims of this study is that we give the power of ‘asking’ to your child so they may improve their social interactions and be motivated to interact with peers and family.
  5. **Duration:** Twenty trials per child, per day. A trial is presenting your child with one toy. The intervention will last for 25 weekdays, with each session of 20 trials lasting between 5-15 minutes.
  6. **Statement of Confidentiality:** Your child’s participation in this research will remain confidential. Only the members of the research team will know details of your child’s participation. Your child will be assigned a letter and a number to protect their identity. The data generated from the research will be stored and secured at Cheryl Ostry’s office in CEDAR Building in a locked file cabinet and on a locked/password protected computer. In the event of a publication or presentation resulting from the research, no personally identifiable information about your child will be shared. The following may review and copy records related to this research: The Office of Human Research Protections in the U.S. Department of Health and Human Services, Penn State University’s Social Science Institutional Review Board, and Penn State University’s Office for Research Protections. The video tapes will be destroyed after 3 years.

7. **Right to Ask Questions:** You can ask questions about this research. Contact Cheryl Ostryn at 814-933 –7008 with questions. You can also call this number if you have complaints or feel you have been harmed by the research. You can also email Cheryl at cuo112@psu.edu. If you have questions about the rights as a research participant contact Penn State University’s Office for Research Protections at (814) 865-1775
8. **Payment for participation:** Your child will receive a toy at completion of the study for his/her participation.
9. **Voluntary Participation:** Your decision to permit your child to participate in this research is voluntary. Your child can stop participating at any time. Your child does not have to do anything they do not want to do. Refusal to take part in or withdrawing from this study will involve no penalty or loss of benefits your child would receive otherwise.

You will be given 2 copies of this consent form. If you agree to the information described above and will allow your child to participate in the research, please print your child’s first and last name below and sign both copies of the parental consent forms provided in the envelope. Then, please return one signed copy of this to your child’s teacher by **XX/XX/2009**. Please retain the other copy of this consent forms for your files.

Please check ONE box only

- I give permission for my child to be videotaped for this research
- I DO NOT give permission for my child to be videotaped for this research

---

Print First and Last Name of Your Child

---

Parent of Guardian Signature

Date

---

Person Obtaining Consent – Researcher  
Cheryl Ostryn

Date





4) Please can you put a check mark next to the name of the items that **your child can label** (tact)

<b>Item</b>	<b>Please check if your child can label the item (✓) or write 'UNSURE'</b>
Pencil	
Spoon	
Cup	
Car	
Frog	
Fork	
Book	
Crayon	
Duck	
Horse	
Dog	
Towel	
Toothbrush	
Chair	
Bed	

5) Please indicate by a check mark if your child understands the following phrases/words:

<b>Phrase/ Words</b>	<b>Please check if your child can understand the phrase (✓) or write 'DON'T KNOW'</b>
Next to	
On	
In front	
Behind	
On top	
Under	
By	
In	

6) How does your child communicate "I'm finished, I'm done, All done, No more"  
 Answer: \_\_\_\_\_

---

Thank you very much ~ Cheryl Ostryn  
 cuo112@psu.edu



4) Please can you list activities that the child enjoys in the classroom (e.g., coloring, sand-play)

---



---



---



---



---



---



---



---



---



---

5) Please can you put a check mark next to the name of the items that the **child can label** (tact)

Item	Please check if your child can label the item (✓) or write 'UNSURE'
Pencil	
Spoon	
Cup	
Car	
Frog	
Fork	
Book	
Crayon	
Duck	
Horse	
Dog	
Towel	
Toothbrush	
Chair	
Bed	

6) Please indicate by a check mark if the child understands the following phrases/words:

Phrase/ Words	Please check if your child can understand the phrase (✓) or write 'DON'T KNOW'
Next to	
On	
In front	
Behind	
On top	
Under	
By	
In	

7) How does the child communicate "I'm finished, I'm done, All done, No more"

Answer: \_\_\_\_\_

Thank you very much ~ Cheryl Ostry  
cuo112@psu.edu



Child's Name:  
First Coder:  
Second Coder:  
Agreement:  
Date:

**APPENDIX E**

**Attending Behavior Data Sheet**

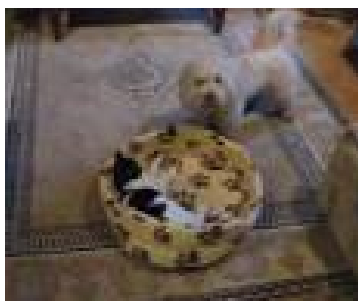
<b>Attending Behavior Data Sheet Score ONLY when seated appropriately</b>	<b>1</b>	<b>(2)</b>	<b>(3)</b>
Eye Gaze to Investigator			
Eye Gaze to item			
Using hands appropriately (playing with, touching object) or hands in lap			
Other (specify): Pointing to investigator, pointing to item, grabbing item etc.			

## APPENDIX F

### Receptive Knowledge Example and Data Sheet



- ❖ *Pointing to slide and asking “What’s that?”* (answer: slide)
- ❖ *What color is the slide?* (answer: yellow)
- ❖ *Is the slide yellow?* (answer: yes)



- ❖ *Where is the cat?* (answer: in the bed, cat bed)
- ❖ *What animal is next to the cat?* (answer: dog, puppy)
- ❖ *Is an elephant in the cat bed?* (answer: no)
- ❖ *Pointing to cat and asking “Is this an elephant?”* (answer: no)





Child's Name:  
First Coder:  
Second Coder:  
Agreement:  
Date:

### APPENDIX G

#### Pre- and Post-Knowledge Assessment Data Sheet

Frog	Duck				
Boat	Drill				

(Circled words indicate items used in the "What's that?" trials and are scored below)

**Pretest Total Correct** \_\_\_\_\_

**Posttest Total Correct** \_\_\_\_\_

**Posttest Correct minus Pretest Correct** \_\_\_\_\_  
(number of **total items** used in study individually adjusted)











## APPENDIX K

### Social Validity Questionnaire

1) The one-on-one teaching method between Cheryl and the child could be implemented in the classroom or natural environment with a child and teacher/therapist

<b>Strongly disagree</b>	<b>Disagree somewhat</b>	<b>Neutral</b>	<b>Somewhat agree</b>	<b>Strongly agree</b>
1	2	3	4	5

2) From watching the teaching method between Cheryl and the child, how easy would you rate the procedure for a parent to implement, if given training?

<b>Very easy</b>	<b>Somewhat easy</b>	<b>Neutral</b>	<b>Somewhat difficult</b>	<b>Very difficult</b>
1	2	3	4	5

3) The child's question-asking behavior increased DURING the study outside of the training setting

<b>Strongly disagree</b>	<b>Disagree somewhat</b>	<b>Neutral</b>	<b>Somewhat agree</b>	<b>Strongly agree</b>
1	2	3	4	5

4) The child's question-asking behavior increased AFTER the study outside of the training setting

<b>Strongly disagree</b>	<b>Disagree somewhat</b>	<b>Neutral</b>	<b>Somewhat agree</b>	<b>Strongly agree</b>
1	2	3	4	5



APPENDIX L

Pictures of Items for "What's that?" (selected)



VITA  
CHERYL OSTRYN

**Education**

2009	Ph.D	Special Education	The Pennsylvania State University
2004	M.S.	Psychology	Middlesex University, London
2003	B.S.	Psychology	Middlesex University, London

**Awards and Grants**

2008 Sept	Recipient of the Organization for Autism Research's 5 <sup>th</sup> Annual Graduate Research Grant. Proposal demonstrated meaningful outcomes for individuals with autism and a valuable contribution to the field of autism (\$1680)
2007 Nov	Recipient of The Robert M. Eisman Fund for the Study of Autism Scholarship. Awarded for promising research in autism (\$3000)

**Presentations**

- Ostryn, C., & Wolfe, P. S.** (April, 2009). Teaching preschool children with autism to ask "what's that?" and "where is it?" Paper presented at *The Experimental Analysis of Behavior Group*, London, UK.
- Wolfe, P. S., **Ostryn, C., & Tarnai, B.** (Dec, 2008). Decision-making in sociosexual domains: Teaching the who, what, when, and where. Paper presented at *TASH's Annual National Conference*, Nashville, TN.
- Ostryn, C.** (Nov 2008). Using pictures to communicate for children with autism. Paper presented at *Network of Autism Training and Technical Assistance Programs (NATTAP)*, Columbus, OH.
- Ostryn, C., & Wolfe, P. S.** (Nov, 2008). Training case managers in 'autism and managed care.' Training presented at the Community Behavioral Healthcare Network of Pennsylvania (CBHNP).
- Ostryn, C., Casey, S. D., Murphy, K., & Davis, K.** (Oct, 2008). A comparison of functional analyses outcomes using multi-element and sequential/reversal design. Paper presented at *The Behavior Analysis Research Colloquium*, State College, PA.
- Ostryn, C., & Wolfe, P. S.** (Dec, 2007). A review of communication competence using the picture exchange communication system (PECS) for individuals with autism spectrum disorders. Poster presented at *TASH's Annual National Conference*, Seattle, WA.
- Wolfe, P.S, Tarnai, B., & **Ostryn, C.** (Dec, 2007). Including advocacy skills in educational and agency plans. Paper presented at *TASH's Annual National Conference*, Seattle, WA.
- Tarnai, B., Wolfe, P. S., Rusch, F. R., & **Ostryn, C.** (Dec, 2007). The 10-step approach to constructing Social Stories for students with ASD. Paper presented at *TASH's Annual National Conference*, Seattle, WA.
- Ostryn, C.** (July, 2007). The picture exchange communication system: A review. Poster presented at the *National Autism Conference*, State College, PA.

**Publications**

- Wolfe, P. S., & **Ostryn, C.** (2009). Functional academics. Book chapter in P. Wehman (Ed.), *Functional curriculum*. PRO-ED.
- Ostryn, C., Wolfe, P. S., & Rusch, F. R.** (2008). A review and analysis of the picture exchange communication system (PECS) for individuals with autism spectrum disorders using a paradigm of communication competence. *Research and Practice for Persons with Severe Disabilities*, 33(1-2), 1-12.
- Stansbery, S. D., Casey, S. D., Vostal, B. R., & **Ostryn, C.** (2008). The effects of simplified habit reversal on thumb sucking. *European Journal of Behavior Analysis*, 9(1), 73-79.
- Casey, S. D., **Ostryn, C., Murphy, K., & Davis, K.** (under review). A comparison of functional analyses outcomes using multi-element and sequential/reversal design. Manuscript submitted to *Journal of Applied Behavior Analysis*.
- Ostryn, C., & Wolfe, P. S.** (under review). Teaching preschool non-vocal children with autism to ask "what's that?" using an alternative and augmentation picture communication system. Manuscript submitted to *Journal of Applied Behavior Analysis*.
- Ostryn, C.** (under review). Teaching preschool children with autism to ask "where is it?" Manuscript submitted to *The Journal of Autism and Developmental Disorders*.
- Ostryn, C.** (in preparation). Teaching preschool children with autism spectrum disorders to discriminate between asking "what's that?" and "where is it?" Manuscript to be submitted to the *Journal of Applied Behavior Analysis*.

**Editorial Experience**

- Reviewer, *Research and Practice for Persons with Severe Disabilities*, 2009
- Co-reviewer, *Research and Practice for Persons with Severe Disabilities*, 2008
- Co-reviewer, *Exceptionality*, 2007