THE EFFECTS OF PARENT IMPLEMENTED TRAINING ON IMPROVISATION OF MANDS BY CHILDREN WITH AUTISM

DISSERTATION

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By

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ABSTRACT

Little research exists on teaching children with autism how to display novel communication responses using the Picture Exchange Communication System. This study examined the extent to which parents could train their children, two young boys diagnosed with autism to exchange novel pictures to request items, and generalize requests to untrained items. Improvisation training included training sufficient exemplars and training for generalization. Generalization probes, assessing each child participant's ability to mand for untrained items, were conducted throughout conditions. Using a multiple baseline design, results demonstrated that both children improvised by using alternative symbols when the corresponding symbol was unavailable across all mand categories: colors, shapes and functions. Results support the findings of Marckel, Neef and Summer (2006) and extend their research by demonstrating that parents can implement interventions to teach novel responses to their children.

For Zachariah and Sydney

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TABLE OF CONTENTS

Page

Abstract.....ii

Dedication.....iii

Acknowledgments.....iv

Vita….....v

List of Tables.....ix

List of Figures.....xi

Chapters:

1. Introduction.....1
   - Purpose of the Study……..……4
   - Research Questions……4
   - Glossary…….……5

2. Review of Literature…….....6
   - Improvisations……..6
   - Mands…….16
   - Parent training……21
   - Treatment Integrity……..…26
   - Social Validity……..…….…27
   - Conclusion…….……30

3. Method.....31
   - Participants/Settings……31
   - Materials……34
   - Pre-experimental Assessments……....35
   - Procedures……...39
   - Experimental Design and Data Analysis……44
   - Social Validity……..…..44

4. Results.....45
Dependent Variable.....45
IOA and Treatment Integrity.....59
Anecdotal.....60
Social Validity.....65
Summary.....66

5. Discussion.....67
Summary of Results.....67
Research Questions.....68
Anecdotal Outcome.....72
Limitations of the Study.....74
Implications for Practice.....75
Direction for Future Research.....76
Summary.....78

List of References.....79

Appendices:

A: Consent Forms.....86

B: Pre-Experimental Assessment Forms.....95

C: Data Collection Forms.....101

D: Procedural Integrity.....104

E: Social Validity.....110

F: Materials.....112

G: Experimenter Background.....115

LIST OF TABLES

Table		Page
2.1	Summary of articles investigating blocked stimuli and novel responses	9
2.2	Summary of articles investigating extinction and novel responses	12
2.3	Summary of research articles on differential reinforcement and novel responses	15
2.4	Summary of research articles on generalization and mand training	19
2.5	Summary of articles on parent implementation/involvement with their child's communication system	25
3.1	Myles' Preferred Items and Examples of Attribute Materials	37
3.2	Cliff's Preferred Items and Examples of Attribute Materials	38
4.1	Percentage of independent improvisations, errors and non-responses by Myles across sessions during baseline and treatment conditions for three mand categories	53
4.2	Percentage of independent improvisations, errors and non-responses by Cliff across sessions during baseline and treatment conditions for three mand categories	54
4.3	Percentage of independent improvisations, errors and non-responses by Myles across generalization sessions during baseline and treatment conditions for three mand categories	55
4.4	Percentage of independent improvisations, errors and non-responses by Cliff across generalization sessions during baseline and treatment conditions for three mand categories	56

4.5 Summary of accuracy of implementation by Dawn and Maria for baseline. Treatment and probes across the three mand categories (colors, shapes, and Functions)……..59

4.6 Number of words in coherent functional phrases verbalized by Myles across baseline and treatment sessions across mand categories……64

LIST OF FIGURES

Figure Page

4.1 Percentage of independent improvisations by Myles across sessions during baseline and treatment conditions for the mand categories colors, shapes and functions……47

4.2 Percentage of independent improvisations by Cliff across sessions during baseline and treatment conditions for the mand categories colors, shapes and functions……48

4.3 Total number of two and three word phrases spoken by Myles during baseline and treatment conditions across mand categories……62

4.4 Total number to four and five word phrases spoken by Myles during baseline and treatment conditions across mand categories……63

CHAPTER 1

INTRODUCTION

Augmentative and alternative communication such as the Picture Exchange Communication System (PECS) or voice output communication aids (VOCAs) provide an effective means of enabling children with autism or severely limited communication skills to exercise control over their environments by requesting reinforcers (Bondy & Frost, 1994; Fowler & Berg, 1988; Marckel, Neef & Summer, 2006; Sunberg & Partington, 1998). Until children are able to identify printed words, these systems typically involve pressing, pointing or handing pictures of graphic symbols to communicate. As the child's repertoire expands, however, communication may become correspondingly more inefficient because of the need to locate individual symbols from an ever-expanding array. The number of relevant stimuli in the child's environment may exceed the number of corresponding graphic symbols that are likely to be available or that can be accommodated with such a communication system. Therefore, the child may not have a means to request novel items.

This can be addressed by providing the minimum number of communicative stimuli that would enable the greatest range of communicative responses. As applied

to graphic symbols, descriptors such as shape, color, size and function can be used to identify a large number of items or objects for which individual symbols might not be available (Marckel, Neef & Ferreri, 2006).

The use of such a strategy involves a type of problem solving. When an individual has no immediate responses that produce reinforcement, the individual may systematically apply behavior in his or her repertoire to generate a reinforceable response (Bijou, 1976). Problem solving can be characterized as pre-current operant behavior. For example, food is received after an individual has completed the pre-current behaviors of getting near the food and putting it on his plate. The behavior/solution to the problem of receiving the food is made more effective as it puts the person in contact with the reinforcement (Skinner, 1974).

One class of problem solving behaviors is improvisation. Improvisation involves "identifying the essential characteristics of the unavailable item and then searching for the effective alternative" (Parsonson & Baer, 1978, p 364). Improvisation is necessary for effective communication. People improvise using novel verbalizations and gestures to communicate to others in their subgroup or in the general populations. For example, teens improvise new ways of communicating with each other, such as making up new words, another example is when kids improvise new ways to play with materials. When traveling abroad and unsure of the correct word for an item, people use gestures or improvisations by describing the object to get what is needed.

A technique to promote improvisation is the use of blocking access to the typically used item while providing access to non-traditional items. Marckel, Neef

and Ferreri (2006) researched the technique of combining blocked access to typically used communication devices (e.g., standard line drawings or pictures used with PECS). Training consisted using of non-traditional communication (e.g., pictures which represent the attributes of an item), teaching sufficient exemplars, and applying differential reinforcement to program for generalization. Results demonstrated that children with autism can be taught to use the descriptors (non-traditional pictorial cards) to mand instead of the normal corresponding card. In addition, results indicated that the children generalized the novel response to untrained items. Generalization was critical for maintaining improvisation behaviors.

Generalization is the application of the target behavior across people, time, and environments. Generalization and maintenance are the indicators of overall changes in the participant's life (i.e., outcomes). This is normally taught through programmed assessment of generalization (Stokes & Baer, 1977). However, another way generalization can be addressed is by practitioners and/or parents (Koegel, Glahn, & Nieminen, 1978; Sanders & Glynn, 1981). Because they tend to have the most frequent contact with their child, it is beneficial to train parents to implement the procedures, including follow up and incidental training. Studies have shown when parents act as the implementer, not only does the child generalize the target behavior but the parent may also generalize the strategy to other children or to other target behaviors (Bondy & Frost, 1992; Laski, Charlop. & Schreibman, 1988; Koegel, Glahn, & Nieminen, 1978; Kuhn, Lerman & Vorndran, 2003; Neef, 1995). Since parents can implement the procedures in more environments beyond the school, they are expanding their children's choices which can leads to more independence.

Purpose of the Study

The purpose of this study is to extend the literature on improvisation of functional communication by children with autism and severe language delays. This study was designed to extend previous research in the following ways:

- having the parent act as implementer
- use of differential reinforcement of other behaviors (DRO)
- blocked access to traditional communication
- generalization Strategies

Research Questions

1. To what extent does training using sufficient exemplars and differential reinforcement impact communication skills, as measured by the percentage of independent improvisations, for children with autism?
2. To what extent will the child participants use novel mands with untrained items?
3. To what extent can parents use sufficient exemplars and differential reinforcement to promote the use of novel requests for individuals who rely on pictorial communication?
4. To what extent do parents participating in the study value (per rating scale) the interventions and outcomes?
5. To what extent do significant others in the participant's life (parent's and child's) value the interventions and outcomes?

Glossary of Key Terms

Differential reinforcement of other behaviors (DRO) – Schedule of reinforcement in which the learner received reinforcement if the targeted behavior does not occur in a specified period (Cooper, Heward and Heron, p. 395).

Establishing operation - A variable's capacity to momentarily alter the reinforcing effect of an object or event and momentarily alter the frequency of the response (Michael, 1988).

Existing mand – The mand that already is part of the persons repertoire.

Extinction – The discontinuation of reinforcement of a targeted behavior (Iwata, Pace, Cowdery and Miltenberger, 1994).

Improvisation - The location of an effective alternative to replace an unavailable item (Parsonson and Baer, 1978).

Mand - "A verbal operant in which the response is reinforced by a characteristic consequence and is therefore under the functional control of relevant conditions of deprivation or aversive stimulation" (Skinner, 1957, pp 35-36).

Sufficient exemplars – The use of many examples of an item or behavior to program for generalization (Stokes and Baer, 1977). For example: to program for the generalization of the color red, several red items (apple, tomato, truck, stop light, etc.) are presented to teach the concept of red to promote the individual's ability to demonstrate the concept of red across stimuli.

CHAPTER 2

REVIEW OF LITERATURE

Many studies have explored the correlation between problem solving and improvisation. Research regarding improvisation and novel responses has evolved from the study of reinforcing 'random' responses in nonhumans to evoking educational novel or creative responses in humans (Clark & Green, 2004; Marckel, Neef & Ferreri, 2006; Neuringer, 2004; etc). This chapter reviews literature on improvisation (novel responses/response variability) in humans.

Creativity/Improvisation

Maloney and Hopkins (1973) operationally defined creativity as "novel behavior not previously displayed in a specific setting or session" (p. 426). Creative or improvisation behavior is important to society and individuals for: solving problems, molding societal norms, increasing technological advances, and enhancing personal growth (Neuringer, 2004). For a novel or random response to become part of a person's repertoire, that response must be reinforced. Reinforcement of novel responses also promotes additional improvisation. Research has identified several strategies to facilitate creativity/improvisation. These strategies include using blocked stimuli, extinction and

differential reinforcement (Clark & Green, 2004; Glover & Gary, 1976; Lallie, Zanolli & Wohn, 1994; Marckel, Neef & Ferreri, 2006; Miller & Neuringer, 2000; Parsonson & Baer, 1978) (see Table 2.1).

Novel behavior is necessary to enhance problem solving skills (Marckel, Neef & Ferreri, 2006). If a child learns to display novel behavior whether in play skills, academics, communication, or use of new technologies, he increases his level of independence and decreases his dependence upon others. This is indeed a problem for children with autism who have difficulties becoming overly dependent upon others or specific discriminative stimuli (e.g., only using of one gesture to request an item). If a discriminative stimulus is not available, the child may revert to problem behavior.

Blocking stimuli. Blocking stimuli is defined as denying access to the normally used stimuli to play or communicate. It has been used to teach discrimination between colors (Williams, Perez-Gonzalez, & Queiroz, 2005) and to teach discrimination between picture communication cards in the Picture Exchange Communication System (PECS) (Bondy & Frost, 1994; Frost & Bondy, 1994). By receiving access to the requested item, the use of the corresponding picture is reinforced. Therefore, the picture becomes the discriminative stimulus. In daily life, the discriminative stimulus may not be available and children may display problem behaviors to request the item (Winborn, Wacker, Richman, Asmus & Geier, 2002). To prevent potential problem behaviors, it may be necessary to teach alternatives if the discriminative stimulus is not accessible (i.e., blocked). It is important to note that when blocking access to the discriminative stimulus, sufficient exemplars and differential reinforcement also should be used

(Parsonson & Baer, 1978). For example, providing different types of objects that are red for the individual to communicate red, while only reinforcing new ways to denote red and ignoring previous ways to communicate red.

Marckel, Neef and Ferreri (2006) explored whether blocked access to normally used pictures in a participant's PECS system would evoke the novel use of alternative pictures (descriptors) to request a preferred item/activity. A multiple baseline across mand categories (colors, shapes and functions) was used for the study. Two children, ages 4 and 5 years, with a diagnosis of autism were trained using standard PECS procedures but using descriptors instead of representational pictures to mand for an item/activity. The picture normally used (e.g., picture of a ball) was blocked/unavailable and only descriptors (e.g., red, round, play) were available for all phases. During baseline, preferred items were placed within visual distance. When the participant attempted to retrieve the object, he was directed to his PECS book. If any attempt was made, he was told "good try" and given access to the object for short periods of time. During treatment, training consisted of sufficient exemplars and physical prompting for the use of the correct descriptors. Once mastery was reached, objects that were similar to the trained objects were presented to assess whether the participant could mand for the item using the improvised picture card. Results indicated that both participants improvised (use descriptor cards) when access to the normal communication was blocked.

One component of blocked stimuli studies is extinction. The following section discussed studies using extinction to promote improvisation.

Study	Description	Results
Clark & Green 2004	* 2 elementary children diagnosed with autism and severe MR * comparison of two procedures across two participants *used delayed cue procedures vs exclusion training to determine effects on use of novel dictated word/symbol relationships	*both participants met criterion use of novel symbols more rapidly in delayed-cue condition
Marckel, Neef & Ferreri 2006	* 2 pre-school boys diagnosed with autism * blocked access to normal communication pictures to determine if children would request reinforcers using descriptors	*both students improvised communication through the use of descriptors across categories
Parsonson & Baer 1978	* 5 preschool children * multiple baseline within subjects and across subjects * used differential reinforcement, blocked access, sufficient exemplars and training to generalize to determine the effects on improvisation of tool use	* increased improvisation of tool use * generalized improvisation was limited to within topographies did not occur to untrained tool classes

Table 2.1 Summary of articles investigating blocked stimuli and novel responses

Extinction. Extinction may play a critical role in facilitating novel behaviors and promoting generalization and maintenance. When an extinction procedure is used, a previously reinforced behavior is no longer reinforced. Extinction indicates that no reinforcement will be given for the target response such as if ignoring an individual when he hits. Researchers have used extinction to promote variability of communication (Drasgow, Halle & Ostrosky, 1998; Duker & van Lent, 1991) and play (Goetz & Baer, 1973; Lalli, Zanolli & Wohn, 1994) responses; and to decrease or eliminate undesirable behaviors (see Table 2.2). For example, Duker and van Lent (1991) investigated whether variability in communicative gestures could be promoted through the use of extinction of high rate gestures for individuals with severe and/or profound mental retardation. After the classification of low rate and high rate gestures, high rate gestures were placed on extinction. Results showed that the low rate gestures increased when high rate gestures were placed on extinction for all participants. During the reversal to baseline conditions, baseline 2 did not replicate baseline1. The number of different gestural requests reduced slightly, remained the same or actually increased from treatment phase 1. This indicates that subjects lasting and irreversible changes in their gestural repertoires may have occurred even after a few weeks of training.

Winborn, Wacker, Richman, Asmus and Geier (2002) demonstrated that extinction components may be necessary to promote higher frequencies of novel behaviors if the existing behaviors are associated with problem behaviors. They evaluated the effects of the use of novel mands on problem behavior. A counterbalanced multi-element design was used across two two-year old children with developmental delays. Both children were trained to use existing mands and novel mands in a controlled

setting. Results indicated that both children used existing mands more often to gain access to the preferred item. When the children used the novel taught mand, the problem behavior decreased. However, since the existing mand was associated with problem behavior, the researchers recommended an extinction component. Results from these studies support the hypothesis that extinction can promote generalization. In addition, Lalli, Zanolli and Wohn (1994) theorize that novel behavior can "be viewed as an operant dimension of behavior"---suggesting that novel behavior/creativity is the product of extinction and reinforcement.

Study	Description	Results
Duker & van Lent 1991	* 6 adults with mental retardation	* increased use of low-rate gestures
	* multiple baseline and reversal	* Baseline 2 did not replicate Baseline 1,
	* used extinction of high-rate gestures to determine the effects on spontaneous low-rate gestures generation	* possible maintenance generalization
Lalli, Zanolli & Wohn 1994	* 2 children with mild disabilities	* increased variability of topographies
	* multiple baseline across subjects	* displayed novel topographies of play
	* used extinction to determine the effect on the variability of topographies in toy play	

Table 2.2 Summary of articles investigating extinction and novel responses

Differential reinforcement. With the exception of challenging behavior, parents and teachers would like to promote additional alternative responses to allow for more choice, and to enable children to adapt to new environments or technologies. Many children with autism may interact with materials in a limited, stereotypic manner (Parsonson & Baer, 1978; Goetz & Baer, 1973), and this limited use results in reduced choices and independence. If a child only knows how to ask for a hamburger using one picture, what does he do when presented with another pictorial variation of a hamburger at another restaurant or he does not have access to a picture? The child needs to know how to communicate differently in different settings.

Miller and Neuringer (2000) examined if contingent reinforcement would evoke variability of a response and decrease repetitiveness of responses in adolescents with autism. Experimental group results were compared with two control groups. The study was conducted on a Macintosh computer with two large mouse buttons. Each button was assigned a different tone. Each trial consisted of four presses of the buttons. The reinforcer was a green smiley face in a triangle on the computer with rising tones. After incorrect responses, no smiley face appeared and the tone was flat. The game was over when the triangle was filled with smiley faces and songs then played on the computer. During the VAR phase, only infrequent responses were reinforced. During the PROB phase, reinforcement was independent of sequence variability. Results showed increased variability during the VAR phase. During PROB 1, low variability occurred but during PROB 2, variability continued as in the VAR phase. Results indicate that individuals

with autism can be taught to vary their responses using contingent reinforcement. This technique appears useful to decrease repetitive stereotypic behaviors which are often associated with autism.

In addition to communication skills, researchers have studied differential reinforcement and novel responses in play (Goetz & Baer, 1973) and academic skills (Glover & Gary, 1976; Moloney & Hopkins, 1973) (Table 2.3). Children with and without disabilities can benefit from learning how to vary their responses. Goetz and Baer (1973) investigated the effects differential reinforcement on form diversity of block building of preschoolers. The study used intervention reversal design with the following conditions: reinforcement of different forms and reinforcement of same forms. During the reinforcement of different forms condition, the teacher provided descriptive social reinforcement for any form that differed from forms already built in the session; same forms were ignored. During the reinforcement of same forms phase, the teacher provided descriptive social reinforcement for same forms; different forms were ignored. Results indicated that form diversity was affected by the descriptive social reinforcement in each phase. The results indicated that form diversity can be influenced by social reinforcement.

Study	Description	Results
Glover & Gary 1976	* 8 children between ages of 9 and 11	* increased targeted response during each condition
	* defined components of Torrance's creativity list operationally	* t-test analysis on Torrance Test showed increased creativity
	* used point reinforcement system to determine the effect on different responses, verb forms, words per responses and statistical infrequence of verb forms	
Goetz & Baer 1973	* 3 four-year old girls	* increased form diversity
	* reversal design	* increased number of new forms
	* used extinction and descriptive reinforcement to determine the effects on form diversity of block-building	* increased duration of play
Maloney & Hopkins, 1973	* 14 4^{th} -6^{th} grade students	* increased use of targetedresponse in each condition
	* operationally defined creative writing	
	* used differential reinforcement in conditions to determine the effects on number and various use of letters, words and sentences	
Miller & Neuringer 2000	* 3 groups (2 control, 1 experimental) experimental–5 teenagers with autism control-5 adults; 5 children age 4-9	* increased variability during contingent reinforcement phase in all groups
	* used contingent reinforcement to determine the effects on response variability on computer mouse	* adult control group displayed most variability
Winborn, Wacker, Richman, Asmus & Geier 2002	*use of multielement design *counterbalance novel and existing mands	* students continued to use existing demands more frequently but displayed less behavior problems when using novel mands

Table 2.3. Summary of research articles on differential reinforcement and novel responses

To summarize, extinction, differential reinforcement and blocked stimuli have been used to facilitate creativity or improvisation of responses of mands (Marckel, Neef & Summer, 2006). It is crucial to assess whether the existing behavior should be extinguished or if alternative behaviors should be added to the child's repertoire before implementing any intervention to evoke novel behaviors. To promote generalization of the novel behaviors importance should be placed upon continued use of natural reinforcement (Neuringer, 2004).

Mands

Manding is the process of requesting an item, (e.g., "Can I have a peach?"). A child may mand for an item using verbal, gestural and/or pictorial communication. Many children with autism or communication delays or no functional speech are taught various communication systems such as gestures, PECS (Picture Exchange Communication System) or sign language to mand for wants and needs. In these systems, normally the child uses one gesture, card or sign to request a particular item. The child receives reinforcement for the communication. For example, a child using PECS will present a corresponding card (picture of a cookie) to request a cookie (Frost & Bondy, 1994).

Sundberg and Partington (1998) demonstrated that children with autism and communication delays learn to communicate faster if communication attempts begin with mands. Mands have a 'built-in' reinforcer. The child gets what he wants. This follows the normal stages of development as babies cry to get a bottle, get changed or fed. Initially, babies do not cry or use gestures to name objects, they cry to make requests.

When designing strategies to teach children to mand for items, it is important to relate the strategy to the assessment. Bourrel, Vollmer and Rapp (2004) researched vocal

mand assessments and mand training procedures. Two participants who displayed significant deficiencies in verbal communication were assessed on their current mand status (e.g., how children mand for an item verbally, type of prompts). Based upon the information attained from the assessment, corresponding procedures were then used to teach verbal manding. Results indicated that mand training needs to be individualized and linked to proper assessment.

Shafer (1994) asserts that successful mand research/training depends upon the ability of the researcher to contrive UEOs (natural establishing operations) and CEOs (contrived establishing operations). CEOs offer the flexibility to evoke a variety of response forms and UEOs can be effectively manipulated for individuals with limited verbal behavior. Shafer reviewed interventions for mand training such as incidental teaching, choice making and interrupted behavior chains in regard to the theory of the manipulation of the establishing operation (EO). Naturally occurring EOs are in effect in incidental teaching. However, many opportunities were not "attended to" by teachers and staff and, therefore, opportunities for mand training were lost. Shafer (1994) emphasized that in most choice making studies, the discriminative stimulus (SD) is in effect instead of the EO, which has led to inconsistencies in the subject's choice. Interrupted behavior chains use CEOs to insure the effectiveness of an EO during the training of mands. Shafer (1994) stated that many studies do not take into account the momentary effectiveness of the EO. Therefore, sufficient exemplars are needed to address short-lived EOs.

Another benefit of first teaching mands to children is that tacting (naming an object) can be taught in conjunction with mands. Arntzen and Almas (2002) compared

mand-tact and tact only training to determine which was more effective in the acquisition of tacts. Participants of two typical girls and three boys with autistic characteristics were randomly separated into two groups. Tact only training included the trainer placing an item in front of the child and asking them what is was. Mand-tact training included the trainer hiding a preferred item and telling the children to find it. If the child could not find the item, he or she was encouraged to ask for it, then to name it. Results indicated the mand-tact condition was more effective than the tact-only condition for improving the child's ability to accurately tact the item

Study	Description	Results
Chamber & Rehfeldt 2003	*4 adults with mental retardation *compared PECS and sign language on acquisition and generalization	*PECS generalized across settings and people more often
Arntzen & Almas 2002	* 5 children: 2 typical girls and 3 boys with autistic features *compared mand-tact vs tact only	*mand-tact procedures significantly more effective to teach tacts
Bourrel, Vollmer & Rapp 2004	*3 participants with significant verbal communication problems *assessed current mand status and based training upon outcomes	*each participant required different type of training based upon assessment
Drasgow, Halle & Ostrosky 1998	* 3 three-year old children with autism * multiple baseline across categories * used differential reinforcement to determine the effects of generalization of a newly taught mand	* increased use of taught mand across three categories
Yamamoto & Mochezuki 1988	*3 students with autism *multiple baseline across subjects *use of modeling and verbal prompts to determine if child would generalized the mand	*manded across setting and objects

Continued

Table 2.4. Summary of research articles on generalization of mand training

Table 2.4 continued

Hall & Sunberg 1987	* 2 teenagers with mental retardation	* manded in presence of same and different stimuli occurred
	* multiple baseline across subjects and behaviors in addition to a mutli-element design	* manded in different ways when presented the same stimuli
	* used the manipulation of conditioned establishing operations (interrupted behavior chains to determine the effect on mand generalization	* manded differently when presented different stimuli
	* used tact prompting and imitation to` determine the effect on mand generalization	* two prompt procedures did not show significant different in outcomes
Shafer 1994	* reviewed three categories of interventions to teach mands: incidental teaching, choice making and interrupted behavior chains	* mand training should address the momentariness of the establishing operation
	* reviewed the role of establishing operations in mand training	* promotes generalization
		* conduct naturalistic

In summary, when a child learns to mand, he is put in direct contact with the reinforcer. Manding allows the child to evoke other's responses in the environment by requesting items. In addition to EOs, the research suggests using strong reinforcers, reinforcers that are easy to deliver and reinforcers that allow for short periods of contact to train mands effectively (Richman, Wacker & Winborn, 2001; Sunberg & Partington, 1998).

Training Parents to be Implementers

Parents are essential for teaching communication to their children. When children are taught to communicate only in a speech therapist's room or in a clinical setting, the child's independence and generalization will likely be limited. Therefore, to facilitate successful life-long outcomes, parents are a critical component in the communication training process. When parents implement strategies, generalization and maintenance appear stronger; the parent can provide incidental training long after structured training has ended (Bondy & Frost, 1992; Laski, Charlop. & Schreibman, 1988; Koegel, Glahn, & Nieminen, 1978; Kuhn, Lerman & Vorndran, 2003; Neef, 1995). When parents implement structured strategies with their children, it is important to analyze not only generalization for the child but generalization of the teaching strategy to other children and/or target behaviors by adults (Koegel, Glahn, & Nieminen, 1978; Sanders & Glynn, 1981).

Stokes and Baer (1977) state that for a behavioral change to be effective, it should "occur across time, persons, setting and the effects of the change sometimes should spread to a variety of related behaviors" (p.350). In other words, the behavior should

generalize for it to be a true change in the target behavior. Since parents automatically are present with the child in various natural settings, various times and with various people, they would appear to be the most logical choice to implement strategies which would promote higher levels of generalizations.

Hall, Cristler, and Cranston's (1970) research was one of the first studies to use parents as trainers using a multiple baseline design. Teachers examined how punishment and reinforcement affected tardiness and test scores. A parent examined the strategies across clarinet practice, Campfire girls projects, and reading. The parents and teachers were quite capable of using the design. Results indicated that when strategies were implemented in a consistent format, tardiness decreased and test scores, clarinet practice, project completion and reading increased.

Laski, Charlop and Schreibman (1988) investigated training parents to implement the natural language program with children with autism who were nonverbal or echolalic. Not only did the children's verbalizations increase when trained by their parents, the children's verbalizations generalized to other environments. In addition, the parents began using the strategy with the participant's siblings. Parents with developmental disabilities can be taught to interact more with their children and to facilitate more communication in their child as well (Feldman, et al, 1986)

Sanders and Glynn (1981) asserted that parents should be taught how to plan, rearrange and monitor their parenting environments to facilitate greater generalization and maintenance. With PECS, this would mean making material available at all times, setting up times for structured training, providing incidental training throughout the day and responding to their child's mands.

Siller and Sigman (2002) conducted a longitudinal study examining the behaviors of the parents of children with autism on the development of communication skills. Twenty-five children with autism, 18 with developmental disabilities, and 18 typical children were separated into groups. Initial tests (early social communication scale, test of developmental abilities, and a language tests) were conducted. They were given again at follow up periods of 1, 10 and 16 years. Caregiver-child interactions also were assessed in a toy area examining the synchronization of attention. Results showed that higher levels of caregiver/child synchronization of attention, etc. lead to higher gains in language skills through time. The reactions of the caregiver/parent play an important role in language acquisition.

To summarize, parents can be trained to successfully act as implementers using various experimental designs (Table 2.5). The use of parents as implementers can lead to greater generalization if they deliver instruction consistently. Since PECS is a communication system used by clinicians, speech therapists, teachers and families, a new strategy to extend PECS would be a prime example of an intervention that parents should be able to implement easily. Benefits of parent implementation includes increasing interactions with the child and increasing the child's generalization of language skills. It is important to make the parent part of the process and not the bystander (Becker-Cottrill & McFarland, 2004; Hall, Cristler & Cranston 1970; Laski, Charlop. & Schreibman, 1988; Koegel, Glahn, & Nieminen, 1978;Reichle, York & Sigafoos, 1991). Since the parent is a familiar person, the child may be more inclined to participate in the PECS training than with clinicians who are unfamiliar. These factors can be critical if the child

tends to withdraw from new people and surroundings (Quill, 2000). Therefore, to enhance the communication process, parents are a critical component for the child to communicate in a meaningful manner (Seung, Ashwell, Elder, & Valcante, 2006)

Study	Description	Results
Seung, Ashwell, Elder & Valcante 2006	*children with autism *father implemented training of expectant waiting and imitation with verbal utterances	*parents began to wait for the child to communicate before another verbalization *promoted social reprocity
Koegel, Symon & Koegel, 2002	*5 families with a child with autism who live geographically distant areas *use of intensive week long program, constant conversations, videos to train parents *examined play skills, verbal communication skills of child, parent implementation on motivation and parent-child interactions	*results indicated that intense parent training improved parent implementation and results in higher verbal communications
Siller & Sigman 2002	*25 children with autism; 18 children with DD and 18 'typical' children *assess verbal and non-verbal interactions of the children *compared groups: 1 group given joint attention during play, 1 group was not	*caregivers synchorinized with child level of attention *higher levels of synchronization lead to better communication over periods of 1, 10 and 16 years
Laski, Charlop & Schreibman 1988	*8 children, 4 nonverbal, 4 echolalic children with autism *multiple baseline across subjects *parent implemented natural language program in the home environment	*child verbalizations increased *child verbalizations in untrained environments increased

Table 2.5 Summary of articles on parent implementation/involvement with their child's communication systems

Treatment Integrity

Since changes in the target behavior are dependent upon the independent variable, it is crucial that precise control of both variables be demonstrated through an accurate description and observation. If the independent variable is not closely monitored, treatment drift can impact the study's conclusion. Impact such as an improvement in the target behavior which was not necessarily a result of the strategy, lack of a robust improvement in the target behavior or no improvement of the target behavior could be demonstrated. If robust improvements are noted but treatment drift has occurred, the results are difficult to replicate (Cooper, Heron and Heward, 1987; Gresham, Gansle, & Noell, 1993; Johnson & Pennypacker, 1980; Peterson, Homer & Wonderlich, 1982; Waltz, Addis, Koerner, & Jacobson 1993).

Gresham, Gansle and Noell (1993) reviewed studies in JABA from 1980 to 1990 involving interventions for children. They found that only one-third of the studies displayed good treatment integrity. They suggest that treatment integrity should consist of the following five components: (1) operational definition of the independent variable which addresses verbal, physical, spatial and temporal dimensions; (2) accurate criteria measurement of each dimension; (3) data collection on the occurrence and non-occurrence of each treatment component; (4) determination of the number of observations and assessment of observation reactivity; and (5) continuous calibration of strategies.

Noell, Witt, LaFleur, Mortenson, Ranier and LeVell (2000) investigated treatment integrity for teachers implementing a peer tutoring program. Results indicated that all the teachers would implement procedures on the days when they were trained but treatment

integrity declined over time. When the experimenters met with the teachers on a daily basis to discuss performance feedback, integrity improved for 2 of the 5 teachers. When the second follow-up strategy was employed, integrity again improved. Overall, treatment integrity baseline improved from a mean of 50% to 87% by the end of the study. The targeted children improved their reading comprehension scores. The mixed results may be an indicator that the experimenter did not have any authoritative control over the teachers. It was their decision to participate. Therefore, the level of cooperativeness and "stake" in the treatment may be a confounding variable to good treatment integrity.

To summarize, for the relationship between the dependent and independent variable to be functional, it is imperative to define and measure both variables. The independent variable needs to be operationally defined, measured frequently and accurately and treatment drift addressed (Gresham, Gansle, & Noell, 1993; Johnson & Pennypacker, 1980; Waltz, Peterson, Homer & Wonderlich, 1982).

Social Validity

Bear, Wolf and Risley (1968) described one characteristic of applied behavior analysis as the social significance of the behavior under investigation. Social validity is the social significance. Wolf (1978) argued that assessing the goals, procedures and effects of a study will make society more apt to examine and potentially use procedures from the applied behavior analysis field. It is important to bridge the gap between research and practice. Social validity is the key to unlock the barriers between the two. Social validity is not the measurement of the primary dependent variable but is a

supplemental measurement that can be used to assess if research goals are socially significant, if intervention procedures are appropriate and if outcomes of the intervention were important to consumers (Morrison, 1999; Schwartz & Baer, 1991).

Social validity is the process of evaluating consumer opinion about research. There are several ways that it can be assessed such as judging permanent products, experimental manipulation, rating scales, choice of preferred interventions after being exposed to two or more interventions and just 'asking them'. The latter is the most common form to assess social validity (Finney, 1991; Schwartz & Baer, 1991; Van Houten, 1979).

Consumers: Before assessment procedures can begin, it is important to identify relevant consumers. Those who are either the participants of the study, significant others in the participant's life, those who interact with the participants who live in the community and those who are members of the extended community are potential consumers. It is easy to identify the direct consumers (the consumer of the study) and indirect consumers (parents, teachers) but it is more difficult to identify the immediate and extended communities (Finney, 1991).

Goals: To investigate goals, the following questions should be answered: Is the target behavior really wanted by society? Is the target behavior a problem for society? Are the dimensions of the target behavior valued by society? Ways to assess the goals after defining the target behavior include rating the importance through questionnaires, surveys or interviews, experimentally determining optimal rate and determining what peers are doing under the same conditions (Wolf 1978). Effective questionnaires should use differential responding, wide range of ratings, specify a period of time, address all

pertinent dimensions, be anonymous and be free of any contingencies. This is the most common way to assess goals, asking why is this important? Van Houten (1979) described the process of experimental procedure of determining the optimum rate to determine the functional goal. He discussed the differences in eye contact under various conditions to determine how much eye contact was appropriate in each condition. The ranges of eye contact would be analyzed to see which had the optimal effect on the audience. The process of assessment of peers is also called the normative based selection. This determines the normal rate that peers exhibit the targeted behavior (Van Houten, 1979).

Procedures: Two ways of evaluating procedures are ratings from individuals in relevant community and choice following exposure to two or more interventions. Ratings include questionnaires and surveys of pertinent consumers. The choice procedure involves exposing the consumers to two or more interventions for the same targeted behavior then asking which intervention they preferred. However, it may not be the most optimal intervention.

Effects: The question is "Are the effects robust?" Normally this is assessed through rating permanent product of the consumers. For example, consumers are given randomly selected video tapes of the phases of the study and are asked to rate the occurrence of the behavior. Did the consumers see the results of the intervention? Fawcett (1991) recommends that not only should the immediate results be evaluated but intermediate and long term outcomes should be evaluated. Did the results generalize to other environments or extend over time?

In summary, social validity is the path bridging research and practice by determining what is important to the participants, to significant others, to the immediate community and to the extended community. Practitioners are more likely to use procedures that are more viable and those which are user friendly (Morrison, 1999; Schwartz & Baer, 1991; Finney 1991; Fawcett, 1991; Van Houten, 1979; Wolf, 1978).

Conclusion

Reinforcement (initial and ongoing), sufficient exemplars, and generalization are indispensable for mand training and for the facilitation of novel responses (Sunberg & Partington, 1998; Winborn, Wacker, Richman, Asmus & Geier, 2002). Children with autism can be taught to mand and to demonstrate novel responses (Drasgow, Halle, & Ostrosky, 1998; Marckel, Neef & Ferreri, 2006).

Although the use of blocked stimuli was originally used for discrimination training, research indicates that it can be used in conjunction with differential reinforcement to facilitate novel responses (Marckel, Neef & Ferreri, 2006; Clark & Green, 2004). Parents can play a critical role in the maintenance of new skills; therefore, using parents as the implementers may enhance generalization (Laski, Charlop. & Schreibman, 1988; Koegel, Glahn, & Nieminen, 1978; Hall, Cristler & Cranston 1970).

This study will extend the literature by examining the effects of training parents to act as implementers to facilitate novel mands.

CHAPTER 3

METHOD

This chapter describes the participants, setting, materials, pre-experimental assessments, experimental procedures and design that were used in the study which examined the effects of parent implemented strategies on the use of attributes to mand for preferred items across three categories (colors, shapes, and functions). This description includes response definitions and measurement techniques of the dependent variables.

Participants and Setting

The participants were selected for the study based on the following criteria: (a) child had a diagnosis on the autism spectrum; (b) child had a prerequisite repertoire of matching colors, shapes and function identification as determined by questionnaire and direct observation, (c) child was recommended and approved by the team for an augmentative/alternative communication system (e.g., Picture Exchange Communication System--PECS) due to limited vocal repertoire; (d) parent used the PECS system with their child on a regular basis; and (e) the experimenter had signed informed consent by the parent participant and for the child participant.

The study was conducted in two homes in adjacent counties in southern West Virginia. All sessions were conducted in a quiet area in the participant's home. Sessions

were videotaped with the permission of all involved parties. The parent participants chose their fictitious code names for the study.

Participants in this study were two white, non-Hispanic boys with autism spectrum disorder and their mothers. Both mothers, white non-Hispanic middle class, were stay-at-home moms between the ages of 30-45. Middle class was defined as financially (successful), politically (no extreme), parenting (use of sound strategies, no extreme or discriminator views) and religiously (protestant) middle of the road as compared with others in West Virginia. Both were married at the beginning of the study although one family filed for divorce during the study. Both mothers were high school graduates who attended conferences on autism, participated in trainings, visited their children's schools, researched information on the internet and were well informed about autism. Both were focused on their child's welfare and were willing to try various strategies to help their child progress.

Myles, age 6, and his mother, Dawn, agreed to participant in the study as his mother reported that Myles had difficulty naming objects on a consistent basis and he often became frustrated when pictures were not available. Myles had been using PECS on a consistent basis for approximately 1 year. Per parent report, PECS had been identified by the Individual Education Plan (IEP) team as a goal to facilitate communication. Myles received limited direct speech services for the past two years although his teacher and mother reinforced the use of the PECS in both environments for the past year. During his first year of speech services, vocalizations was targeted by the IEP team, however, his communication did not progress, therefore the team agreed to try PECS to increase his communication. He was in phase 4 of PECS (sentence structure ex:

"I want" "cookie"), however phase 4a, attributes, had not been introduced. His vocalizations were emerging, however his mother reported that he displayed difficulty linking words into sentences and did not use sentences consistently. Myles could sing and repeat phrases, but his mother reported that most of it was not functional. He lived with his mother and older brother. His father had moved out of the home during the study pending a divorce. The family lived on the outskirts of a medium size town and had access to services through the school system and the local MRDD department. He was diagnosed at age 3 with autism. Myles attended 1st grade and received both self-contained autism services (75%-80%) and well as services in a regular 1st grade classroom (20%-25%). All sessions were held at the kitchen table per mother's choice.

Cliff, age 5, and his mother, Maria, agreed to participate in the study as she reported that Cliff just began PECS within the past 4 months prior to the beginning of the study and was progressing well. Cliff's mother was interested in any additional types of service/research available on PECS. Per mother's report, PECS had been identified by his IFSP team to facilitate communication. He had yet to receive speech therapy. Maria stated that he would begin after the end of this study. His mother reported that Cliff consistently used PECS in phase 4 (sentence structure) although phase 4a (attributes) had yet to be introduced. Cliff displayed limited use of verbal language although he displayed excellent receptive communication skills. His verbal repertoire was primarily imitation of parent and no initiations noted. Cliff was an only child and lived with his mother and father. His extended family (i.e. grandparents, uncle, etc.) were also prominent in his life. The family lived in a small town and received services from the local school system. Cliff was diagnosed with autism at the age 4. He attended a

preschool classroom 2 days a week and received special education services. Sessions were conducted throughout the home based upon the location of materials (e.g., kitchen for food items, playroom and den for toys).

Materials

Preferred items in each possible category (food, drink and toys) served as the stimuli for the communication exchanges during training and generalization probes. Myles primarily used edible and liquid stimuli as his interactions with toys were limited to large unmovable objects (e.g., large screen TV, PC) and Dawn preferred to use mobile, easy-to-access items. Cliff used various types of stimuli including edibles, drinks and various toys. Preferred items for each child participant were identified through an experimenter developed questionnaire completed by the parents and through direct observation by the experimenter (Appendix B). Access to preferred items was limited during non-experimental time to strengthen the reinforcing effects of each item (Vollmer & Iwata, 1991). Two cameras (35 mm and a digital) and a video recorder were used to visually document sessions. Data collection sheets for child and parent participants were provided to observers.

Laminated pictures of the preferred items and their symbols for their characteristics (e.g., shape, color, and function) served as the communication stimuli. Distracter pictures consisted of characteristics that did not match the preferred item. These stimuli were in the same form that the child normally uses for PECS communication which included 2"x 2" square Board Maker drawings, line drawings from the internet, and clip art (Appendix F).

Pre-Experimental Assessments

Skill Assessment

The skill assessment consisted of two sections: a parent questionnaire and direct observation. Parents were asked to complete a simple questionnaire about their child's ability to match colors, shapes and functions (Appendix B). Skills were then assessed through direct observation by watching to see if the child to matched/grouped colors and objects for functional use and shapes. The child was shown various small objects that were red, blue or yellow. The experimenter observed to see if the child began to match the colors when requested. Neither Myles nor Cliff required prompting for color, shape or function matching. Both demonstrated good knowledge of all three attribute concepts. Myles also inconsistently verbalized these attributes when asked but did not initiate the tact. This process was completed for all mand categories (Appendix B).

Preference Assessment

A reinforcer assessment was conducted using a two-step process. First, parents/siblings were interviewed about child's likes and dislikes using a basic questionnaire (see Appendix B). Then a formal assessment was conducted. Parent identified items from each mand category were used. Three to four objects from one category were placed in front of the child. Free access was provided to the item. The child's response (grabbing for the item) was observed and recorded. The top item from each group from the same category was placed together to determine which item he liked the most. Use of items from the high (1-3) and middle (4-7) preferred groups were used

for training and generalization probes. This procedure was completed for each of the mand categories. Preferences were documented using an experimenter designed checklist (see Appendix B).

Category	Preference Hierarchy	Examples of corresponding corresponding attribute Materials	Example of distracter materials
Edibles	*High:*		Any color, shape or function that does not correspond with the picture. For example, for Ovaltine™, non-examples would include , red, blue, yellow, square, eat or play, etc.
	brownies	Brown, square, eat	
	Doritos	Orange, triangle, eat	
	Fruit roll ups	Green, yellow, red, circle, triangle, square, rectangle, eat	
	Middle:		
	Pretzels	Brown, heart, eat	
Drinks	*High:*		
	juice packs	Purple, green, red, square, drink	
	ovaltine	Brown, circle, drink	
	Middle:		
	Water	White, circle, drink	
	7 up	White, yellow, circle, drink	
Toys	*High:*		
	Duck	Yellow, oval, play	
	computer	Silver, black, square, play	
	Middle:		
	Ball	White, red, green, circle, play	
	Truck	Red, rectangle, play	

Table: 3.1 Myles's Preferred Items and Examples of Attribute Materials

Category	Preference Hierarchy	Examples of corresponding attribute Materials	Example of distracter materials
Edibles	*High:*		Any color, shape or function that Does not correspond with the picture
	Marshmallows	White, square, eat	
	Oreos	Black, circle, eat	
	candy corn chips	Orange, triangle eat	
	Middle:		
	pretzels	Heart, brown, eat	
Drinks	*High:*		
	herbal tea	Brown, circle, drink	
	milk	White, rectangle, drink	
	Middle:		
	juice	Yellow, red, square, drink	
	sprite	White, round, drink	
Toys	*High:*		
	Truck	Red, rectangle, play	
	Blocks	White, black, green, yellow, blue, square, play	
	computer	Silver, black, square, play	
	pop up toy	Green, oval, play	
	Middle:		
	ABC letters.	Red, green, blue, play	

Table 3.2 Cliff's Preferred Items and Examples of Attribute Materials

Procedures

Parent Training:

Strategies are more likely to be maintained in the home and community environments if parents are involved as observers and experimenters (Hall, Cristler, Cranston, & Tucker, 1970). Since this was a multiple baseline across mand categories, parents were taught baseline and training procedures. Parents received training by the experimenter prior to each phase. Specifically, the parents were trained on baseline procedures and, prior to the training phase, parents were taught how to implement strategies while reminded to use baseline procedures on the other categories until all three were in intervention phase. Training consisted of verbal direction, modeling, and role playing. First, the parent was provided a written copy of each step of the phases (Appendix D—treatment integrity). Second, the investigator explained how to complete each step of a phase, providing modeling if necessary. Third, the parent was asked to demonstrate how to implement the phase while the experimenter observed. Verbal direction was provided by the experimenter as needed. Fourth, the parents were asked to continue to demonstrate/state how to implement the phase until each step reached 90% accuracy for three consecutive trials. Ninety percent is recommended by Bondy and Frost (2002) for training PECS implementers. After parents reached mastery during training on the strategy, the parent was asked to again demonstrate/state baseline procedures since both procedures were used concurrently due to the multiple design. Should parent implementation per treatment integrity checklists and parent data collection forms fall

below 80% accuracy, parents were retrained. One parent required minimal training each observation date to maintain high treatment rates due to reported stressors (divorce) in the home (see Appendices C & D).

Baseline

One of the preferred items identified per the reinforcement assessment (e.g., a graham cracker) was placed within visual range (approximately 12" in front) of the child. The corresponding picture of the item was placed below the item in front of the participant. If the participant manded for the item by pointing to or handing the picture, the parent provided descriptive feedback and praise (i.e., "Good, you asked for the graham cracker.") along with brief access to the manded item (e.g., a piece of the graham cracker). An improvisation probe trial was immediately conducted. The picture of the item was removed and six descriptor symbols, three of which were the characteristics of the preferred item and three of which were not characteristics, were placed in front of the child. If the child did not make any attempt to mand for the item using one or more descriptors within 10 s, another opportunity was provided by moving the desired item closer to the pictures. If still no response, the trial ended and another trial was initiated. If the child attempted to reach for the object, the trial ended. If the child manded for the item using one or more descriptor stimuli (shape, color, or function), then a piece of the desired item was immediately provided. If the child attempted to mand with a distracter picture (red for graham cracker), the trial ended and the child did not have access to the desired item.

Training

Training consisted of exemplars which were characteristics or represented a function of the preferred item. A preferred item (s) and a neutral item (an item that was of no interest to the child per parent report) were placed in front of the child approximately 12" from the child along with the corresponding symbols (e.g., silver for paperclip and brown for graham cracker). If the child started to reach for the item, the parent guided his hand to the corresponding picture and provided short access to the desired item. If the child initiated the exchange using the correct descriptor, a piece of the preferred item or a short play period (approximately 30s-1m) of the toy was provided with immediate verbal feedback (i.e., "Good, you asked for the graham cracker using the color brown"). If the child provided the parent with the silver color then the paperclip was provided. Should the child not show interest in the paperclip, then the parent reset the trial and taught the use of 'brown' through the following physical guidance procedure. The parent guided the child's hand to the correct card to request the preferred item while stating the color, shape or function (e.g., "This is brown."). The trial was then reset and started again. If the child made two consecutive errors, the child was physically guided to give the correct picture to ensure success on the third trial.

Follow-up probes: A probe was conducted immediately after training. Pictures of characteristics and distracter pictures were placed in front of the child along with a trained stimulus. During the first mand category, the child participant provided the symbol for the color of the object. In the second category, the participant could provide either the color or shape or preferably, the color and the shape. In the third category, the participant could provide the color, shape or function, a combination of two or preferably,

all three descriptors. In the second or third categories, when the participant continued using the same descriptor to mand for the item (more than 3 times), the card was removed to promote the use of other potential descriptors. Data were collected on independent improvisations. Once mastery was reached at 85% for three consecutive sessions in one mand category, then intervention began in the next category until training in all three categories had occurred.

Generalization probes

Generalization probes were conducted in each mand category. Stimuli for the probes consisted of preferred untrained items and corresponding descriptor and distracter symbols. Baseline procedures were in effect exception the trial began with the use of the characteristics and distracters symbols.

Response Definitions and Recording

Each trial for the child was scored as a non-response, error, or improvisation. The trials were scored by observers who reviewed videotapes. The experimenter, a Ph.D. candidate, and a 2nd year Ph.D. student at OSU served as the observers. Both had extensive experience working with children with autism. The experimenter trained the second observer on data collection and treatment integrity. Non-response (N) was scored for a not attending to the item or cards, walking away, or behavioral issue that led to the child begin taken away from the area. An attempt/error (E) was scored for any behavior exhibited other than accepted augmentative or alternative communication to mand for the item (e.g., moving the experimenter's hand to the item, grunting and pointing to the item). The presentation of a symbol to the experimenter which did not correspond to the preferred item was also scored as incorrect (e.g., handing the picture of a square for a

round cookie). An independent improvisation (I) was scored as using one or more appropriate novel pictures (descriptors) to mand for the item (handing the picture of the circle for the round cookie) (see Appendix C).

Treatment integrity was determined by scoring each step in the implementation procedures. Each step in a trial for the parent was scored as yes or no for using the correct procedure using an experimenter developed checklist. The trials were scored by observers who reviewed videotapes. A yes (Y) was scored if the parent correctly implemented the step in the procedure. A no (N) was scored if the parent incorrectly implemented the step of the procedure. For each trial the number of yes responses was divided into total steps to calculate percentage of correct implementation (see Appendix C)

Inter-observer agreement. Most of the sessions were videotaped. On a few occasions the child reacted to the camera (aggressively) but would participate when it was off. The experimenter attempted to tape every session but only approximately 85% of the sessions were videotaped. Twenty five percent of the videotaped sessions for each participant were chosen to assess IOA. Observer records were compared on a trial-by-trial basis. An agreement was defined as both observers recording the same code for each trial. IOA was calculated by dividing the number of agreements by agreements plus disagreements and multiplying by 100%.

Treatment integrity. Treatment integrity is defined as the extent to which the independent variable is correctly implemented (Peterson, Homer, &Wonderlich, 1982). Treatment integrity checklists for each phase of the study were used by two trained observers to code whether the experiment followed correct procedures. (see Appendix

D). Treatment integrity was assessed on at least 20% of each phase for each research site. The checklist was coded as (Y) for observed or (N) for not observed

Experimental Design and Data Analysis

A multiple baseline design across mand categories (colors, shapes, and functions) was used to examine the effects of parent training on improvisation of mands. Data were collected on student (treatment data) and parent performance (treatment integrity). This design was used to examine generality, reliability, and the training procedures across the categories. Two families participated in this study to assess replication. Generalization probes were conducted throughout the study.

The multiple baseline design was graphed for visual analysis. The experimenter visually analyzed if the intervention had an effect on the use of descriptor pictures to request desired items. Data point, data trends, differences between baselines and treatment tiers were visually assessed to determine experimental control. In other words, did the independent variable have an effect on the dependent variable? (Cooper, Heron & Heward, 1987).

Social Validity

Social validity is defined as the "acceptability or viability of a programmed intervention" (Schwartz & Baer 1991; p. 189). In other words, did the intervention have any practical value to concerned persons? Social validity outcomes were determined through an experimenter designed questionnaire (Appendix E). Parents and significant others in the child's life were asked to record any improvisations of mands for untrained items or untrained settings (generalization) and perceptions regarding parents.

CHAPTER 4

RESULTS

This chapter reports the results of the research. The dependent variable, improvisations of mands, is described in this chapter as well as a visual analysis of the graphed dependent variable along with individual child and parent data across baseline and treatment conditions. The inter-observer agreement and treatment integrity of procedures denote believability in the results. An anecdotal outcome, Myles' verbally linking words, is reported. Also conveyed is social validity, the value of the study to relevant consumers.

Dependent Variable

For single subject research, a visual analysis of the graphed information can determine if the independent variable had an effect on the dependent variable (Cooper, Heron, & Heward, 1987). Figures 4.1 and 4.2 display the percentage of independent improvisations across baseline and treatment conditions across three mand categories: colors, shapes and functions. A visual analysis of the figures show that blocking access to normally used stimuli did indeed have an effect on the use of alternative ways (improvisations) to mand for preferred items across mand categories. Experimental control was shown by the increase in the use of improvisations from baseline to training

across all three mand categories for the participants. Generalization to untrained objects increased once training was implemented across the mand categories. The increase in the use of improvisations was replicated across Myles and Cliff.

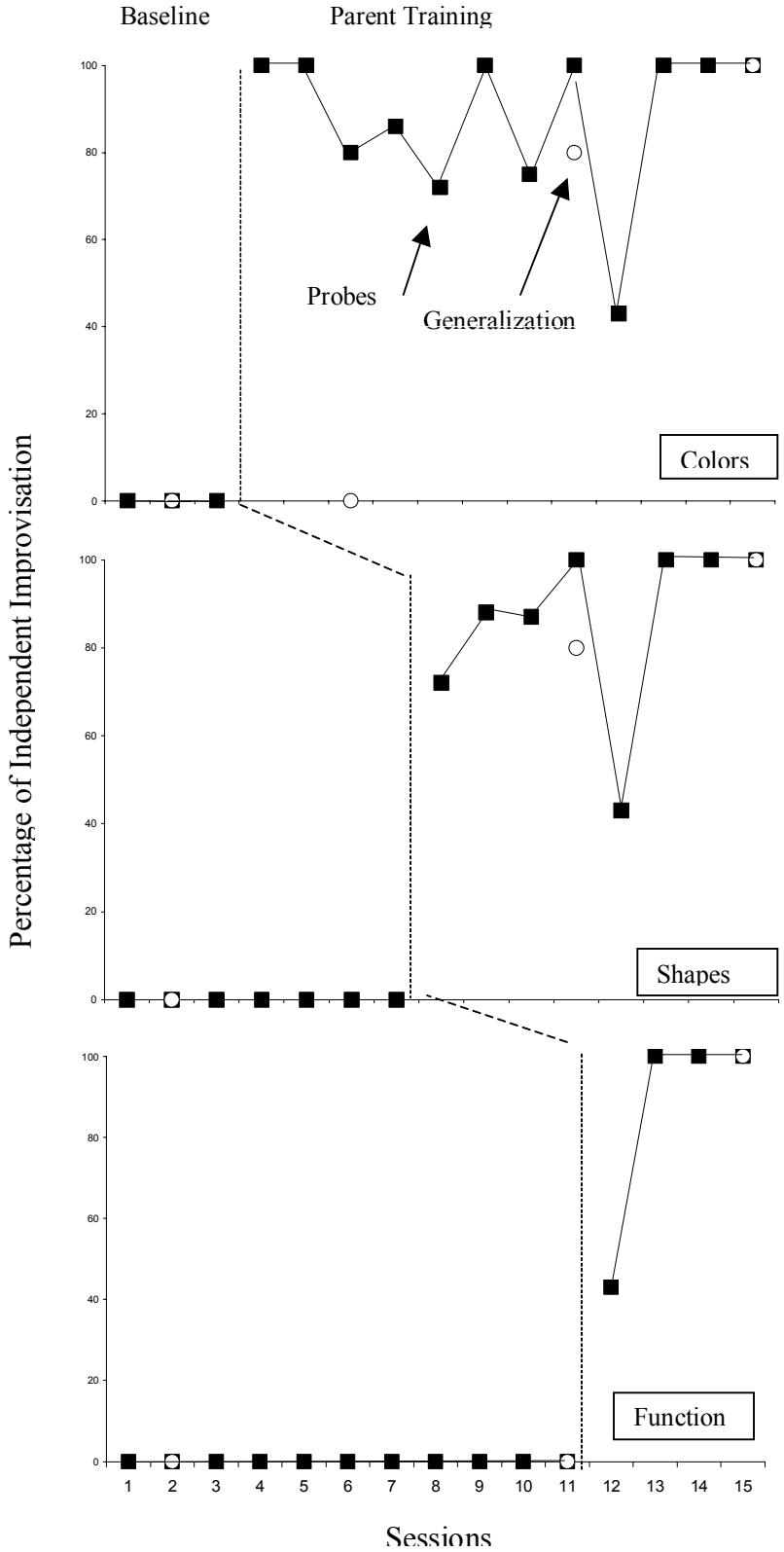

Figure 4.1 Percentage of independent improvisations by Myles.

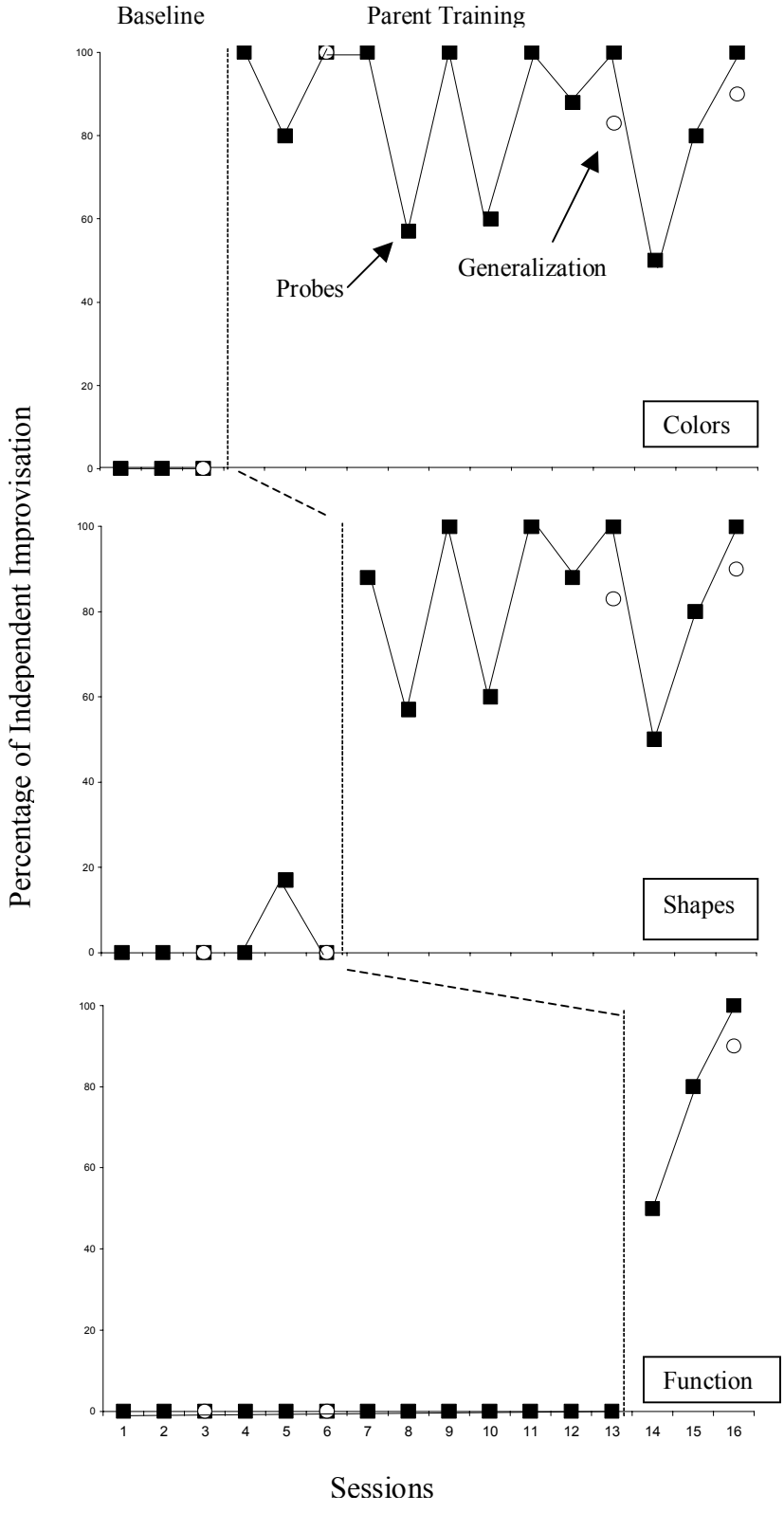

Figure 4.2 Percentage of independent improvisations by Cliff.

Myles

Figure 4.1 shows the percentage of independent improvisations by Myles across sessions during baseline and treatment conditions for three mand categories: colors, shapes and functions. During baseline, there were zero occurrences of improvisation in all three mand categories. Throughout baseline, improvisations were nonexistent. Myles did not mand using the PECS cards 46% of the time. The other 54%, he attempted to grab for item or use his mother's arm to get the item for him (Table 4.1). A generalization probe was conducted during session 2 of baseline, that is, an item that was not trained was presented to determine if the child would mand for the item using improvisation. Myles did not improvise using any of the categories (colors, shapes or functions) during the generalization probe in baseline.

When training was implemented, data indicated an immediate and substantial increase in improvisations across categories. In the first mand category (colors), improvisations increased from zero to a mean of 80% (Range: 43% -100%). During 7 of 12 training sessions, the percentage of improvisations was 100%. Other variables influenced Myles' performance during 2 of the 12 sessions. Myles became upset and displayed continuous self-injurious behaviors (hitting head) in session 10 and only attained 75%. During session 12 he was ill and achieved 43%. As compared to baseline conditions, non-responses decreased from a mean of 46% to a mean of 3% and errors from a mean of 54% to a mean of 3% (Table 4.1.). Also, training sessions became shorter and he displayed the improvisations with less

training each session. Generalization was assessed in session 6, during treatment, however, Myles did not display generalization at that time. He requested a trained item that was out of reach.

During the second mand category (shapes), improvisations increased from zero to a mean of 87% (Range: 43% - 100%). For 4 of 8 training sessions, the percentage of improvisations was 100%. Again, other variables influenced his performance for 1 out of 12 sessions. During session 12, Myles was ill, his attention span was shorter and he displayed challenging behaviors (slapping head, etc.) when pressed for responses. Interestingly, as compared to the training condition in the first mand, errors increased from a mean of 3% to a mean of 5% and non-responses increased from a mean of 3% to a mean of 8% (Table 4.1). Generalization was examined in session 11. Myles generalized to an untrained item 80% of the opportunities using color and shapes (e.g., purple, square for a juice drink).

In the third mand category (functions), improvisations increased from zero to a mean of 86% (Range: 43%-100%). During 3 of 4 training session, the percentage of improvisations was 100%. Again, illness affected session 12 and he only achieved 43% independent improvisations. As compared to the second mand category, errors decreased from to a mean of 5% from a mean of 4% and non-responses increased from a mean of 8% to a mean of 11% (Table 4.1). Generalization was assessed during session 15, Myles improvised 100% of the time (i.e. orange, triangle, eat for piece of candy).

Cliff

Figure 4.2 shows the percentage of independent improvisations by Cliff across sessions during baseline and treatment conditions for three mand categories: colors,

shapes and functions. Similar to Myles, Cliff's data also shows immediate and substantial increases with the introduction of each new mand category. Within baseline, there were zero occurrences of improvisations across mand categories with the exception of session 5 in the second mand category (shapes) when he improvised a shape to request an item. Maria, his mother, stated that his grandmother had been working on shapes with him the previous night, however, baseline data returned to 0%. During baseline, 56% of his responses were errors (attempting to grab the item or use his mother's arm to get the item) and 44% of the trials were non-responses. Generalization was assessed during session 3 for an item an untrained item, with 100% non-response.

When training was implemented data results indicated an increase in improvisation across categories. During the first mand category (colors), improvisations increased from zero to a mean 93% (Range: 50%-100%). He displayed 100% improvisation for 7 of 13 sessions. As compared to baseline, errors decreased from a mean of 56% to a mean of 7% and non-responses decrease from a mean of 44% to a mean of 1% (Table 4.1). In session 6, a generalization probe was not planned but Cliff spontaneously manded untrained items during the session. Generalization was noted and he correctly improvised 100% of the time, again this was self-initiated.

In the second mand category (shapes), improvisation increased from 0 to a mean of 91% (Range 50% -100%). During 4 of 10 sessions, the percentage of improvisations was 100%. Compared to the first mand category, errors increased from a mean of 7% to a mean of 11% and non-responses increased from a mean of 1% to a mean of 4% (Table 4.1.). During session 13, generalization was examined and Cliff improvised 83% of the time.

During the third mand category (functions), improvisations improved from 0% to a mean of 77% (Range: 50% -100%). Errors dropped to 3% from a mean of 11% and non-responses decreased from a mean of 4% to a mean of 2% (Table 4.1.) Generalization was examined in session 16 and Cliff generalized 90% of the trials for the session.

Session	% Error	% Non Response	% Ind. Improv.	# of Trials
BL: 1	40%	60%	0%	5
2	0	100	0	4
3	100	0	0	3
TR1: 4	0	0	100	2
5	0	0	100	3
6	10	10	80	10
TR 2: 7	14	0	86	7
8	14	14	72	7
9	12	0	88	9
10	0	13	87	8
11	0	0	100	6
TR 3: 12	43	14	43	6
13	0	0	100	3
14	0	0	100	4
15	0	0	100	4

Table 4.1 Percentage of independent improvisations, errors, non-responses by Myles across sessions during baseline and treatment conditions for three mand categories.

Session	% Error	% Non Response	% Ind. Improv.	# of Trials
BL: 1	60%	40%	0%	4
2	75	25	0	4
3	33	67	0	3
TR 1: 4	0	0	100	3
5	15	5	80	10
6	0	0	100	8
7	12	0	88	8
TR 2: 8	28	15	57	7
9	0	0	100	6
10	30	10	60	10
11	0	0	100	5
12	12	0	88	7
13	0	0	100	3
TR 3: 14	0	50	50	4
15	10	10	80	10
16	0	0	100	5

Table 4.2 Percentage of independent improvisations, errors, non-responses by Cliff across sessions during baseline and treatment conditions for three mand categories.

Session	% Error	% Non Response	% Ind. Improv.	# of Trials
2	0%	100%	0%	2
6	42	57	0	7
11	10	10	80	10
15	0	0	100	4

Table 4.3 Percentage of independent improvisations, errors and non-responses by Myles across generalization sessions during baseline and treatment conditions for 3 mand categories.

Session	% Error	% Non Response	% Ind. Improv.	# of Trials
3	0%	100%	0%	3
6	0	0	100 (self-initiated)	6
13	0	17	83	6
16	10	0	90	10

Table 4.4 Percentage of independent improvisations, errors and non-responses by Cliff across generalization sessions during baseline and treatment conditions for 3 mand categories.

IOA and Treatment Integrity

Sessions were videotaped for data collection with the following exceptions. Sessions 11, 14 and 15 for Myles were not videotaped as he was very interested in the videotape and did not focus on the task for session 11. Myles initiated requests after all video equipment had been stored for sessions 14 and 15. Sessions 9, 11 and 16 were not videotaped for Cliff due to reactivity to the video camera. Sessions 5, 6, 12 are partial sessions for the same reason. Cliff was distracted by the camera and started exhibiting challenging behaviors (screaming, hitting head) when the camera was pointed at him. When the camera was down, Cliff would focus on the tasks. Since the goal of the study was to examine the effects of the training on improvisation and not challenging behaviors, the experimenter decided that direct live observation was a better data collection method. For all sessions not videotaped or partial sessions the experimenter collected data from live observations.

IOA

Twenty-six percent of the sessions were assessed for inter-observer agreement for Myles and twenty-five percent for Cliff. One session per condition, baseline and the three mand categories, were examined. Two observers (experimenter and a 2nd year Ph.D. student at OSU) reviewed the tapes and scored if an error, non-response or improvisation occurred using the experimenter designed data collection forms. The data were then compared to determine agreements vs. disagreements. IOA for Myles' independent improvisations was a mean of 93% (Range: 83%-100%) and Cliff's was a mean of 87% (Range: 72%-100%).

Treatment Integrity

Twenty-six percent of the sessions were assessed for treatment integrity for Myles and twenty-five percent for Cliff. An experimenter designed checklist was used to determine treatment integrity for each condition: baseline and treatment (across the three mand categories). Two observers (experimenter and 2nd year Ph.D. student) viewed videotapes and completed the checklists. The checklists were then used to compute agreements vs. disagreements. Treatment integrity for Myles was a mean 91% (Range: 80%-100%) for all conditions. Specifically, baseline was 90%, the mean for training sessions was 93%, and probe sessions was 88%. Treatment integrity for Cliff was a mean of 95% (Range: 87%-100%). Specifically, baseline was 100%, training sessions was 96%, and probe sessions was 88%.

Session	% Correct for Dawn	% Correct for Maria
1	90%	100%
2	90	100
3	100	100
4	100	100
5	100	100
6	100	100
7	100	96
8	95	94
9	99	100
10	88	100
11	100	100
12	94	85
13	100	100
14	100	100
15	100	99
16	-----	100

Table 4.5 Summary of accuracy of implementation by Dawn and Maria for baseline, treatment and probes across the three mand categories (colors, shapes and functions).

Anecdotal Outcomes

Myles verbalizations

As reported in Chapter 3, Myles verbal skills were emerging. However, Dawn, his mother, reported that he rarely initiated a request for items verbally. Normally, his verbalizations were limited to reading from a book or singing short songs. Myles began linking the descriptive words with the objects (e.g., brown brownie, red candy) with the use of the PECS alternative cards beginning with session 4. Dawn reported that although he could group the color or shapes of objects and sometimes state the color, he had never linked the two together. Again, the experimenter asked if he had been working on this at school since he seemed to pick it up so fast, and she reiterated that he had been using complete sentences with PECS (e.g., "I want cookie) but had not been taught any attributes or how to use attributes to request items. Each verbalization was in conjunction with the use of the PECS cards and with the exception of baseline when he spoke about what was on the TV or expressed his desire to stop. Although verbalizations were not an expected outcome of the study, it is this experimenter's opinion that this outcome should be noted.

Figure 4.3 displays the cumulative number of verbalizations that were made by Myles during the study. It is interesting to note that the majority of two word phrases were in the first mand category, three word phrases in the second mand category and four and five plus in the third mand category. Table 4.4 details the exact number for each mand category and provides examples of the verbalizations. This

outcome mirrors other research on PECS which indicates that although PECS is not directly used to facilitate speech, the children begin to use speech or increase the length of their verbalization in conjunction with the use of PECS.

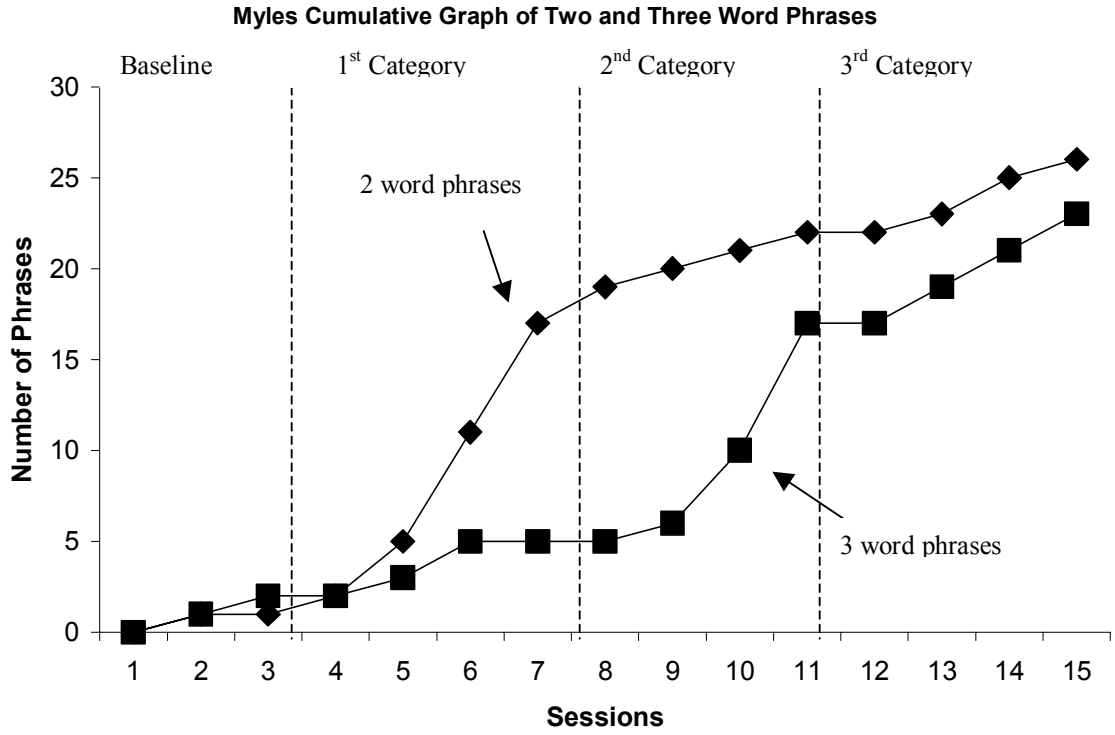

Figure 4.3. Total number of two and three word phrases spoken by Myles during baseline and treatment conditions across mand categories.

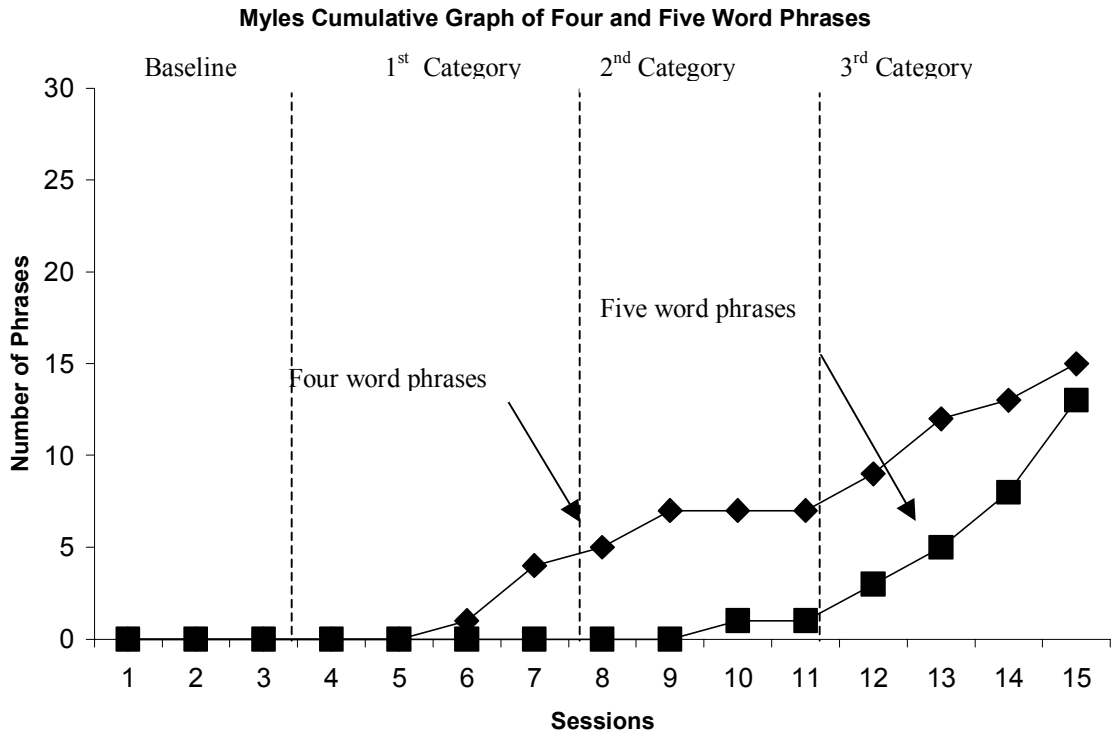

Figure 4.4 Total number of four and five word phrases spoken by Myles during baseline and treatment conditions across mand categories.

	2 word Phrases	3 word phrases	4 word phrases	5 word phrases
BL	1 (ex: stop, no)	2 (go, go away)	0	0
Training—colors	16 (ex: green juice)	3 (ex: Want green juice)	4 (ex: I want green, juice)	0
Training—shapes	5 (ex: square juice)	12 (ex: green, square, juice)	3 (ex: Want green square juice)	1 (ex: I want green square juice)
Training—functions	4 (ex: green drink)	5 (ex: green, square drink)	8 (ex: Want green square drink)	12 (ex: Want, red, yellow, green, triangle, eat)

Table 4. 6 Number of words in coherent functional phrases verbalized by Myles during baseline and treatment sessions across mand categories.

Social Validity

Experimenter-designed social validity questionnaires (Appendix E) were completed by the child's relevant consumer (parents) to evaluate intervention goals, procedures, outcomes and value.

When questioned, respondents stated that the children increased their use of improvisations to mand for preferred items. At the beginning of the study, the children were unable to mand for the items using attributes; however by the end of the study the children could mand for preferred items using colors, shapes and/or functions. Reports indicated that relevant consumers felt the children could request items if the corresponding picture was not available.

In addition, relevant consumers were asked if the child ever improvised to mand for items outside of experimental conditions during the study. All respondents documented that yes, both children improvised through the used of attributes to request items outside of the study. Ranges were provided to estimate occurrences of improvisations. It was reported that Myles manded between 1-10 times although he improvised (use of the attributes) verbally and not pictorially. Reports indicated that Cliff used the novel mands between 11-20 times. Additionally, reports indicate that he expanded the use of the attributes from "black circle" to "black, white circle" for an Oreo cookie since the last session to the completion of the social validity questionnaire (4 day interim).

Using a Likert scale, with ratings of 1 (disliked) to 5 (liked), parents were asked about training received from the experimenter and the procedures. Dawn and Maria rated both the training and procedures as 5. Both parents reported that they would continue to

use the procedures after the study to further promote improvisations. Both parents requested copies of the materials for continuation of training. Maria, Cliff's mother, stated she planned on training the specialist who came to her home on the procedures. She stated that she wanted all Cliff's PECS trainers to be using the same procedures as she thought this was beneficial for Cliff.

Both parents reported that the study was a positive experience and would participate in another study on the use of PECS if asked. Cliff's mother reported that Cliff's ability to improvise would better prepare him for kindergarten as all pictures would not be available and he could communicate colors, shapes and functions which is a critical skill in kindergarten. Dawn, Myles' mother, stated that she thought it was important that Myles be able to improvise, especially verbally. She literally did a cheer when Myles began linking words to request items (e.g., "want red, yellow, green, triangle, eat"). Dawn stated that Myles often 'forgets' the name of items and will revert back to grunting, hitting his head or hitting others to request the item but now he has options to request items if he cannot name it or does not have the picture available.

CHAPTER 5

DISCUSSION

This chapter discusses the results of this study examining the effects of parent implemented training on improvisation of mands by children with autism. Specifically the following sections are presented: a summary of results, the extent which the research answered the research questions, anecdotal outcomes, limitations of the study, implications for research, and direction for future research will be discussed.

Summary of Results

Data indicated that both Myles and Cliff were able to improvise using novel mands after training from their parents. During baseline, both children were unable to demonstrate the use of novel mands with one exception for Cliff. An outside variable, his grandmother, worked on shapes outside of the study one evening; this appeared to influence Cliff's performance during that session. Once training had been implemented, both Myles and Cliff displayed an increase in independent improvisations to request preferred items. This occurred across mand categories for both children. Measures of treatment integrity remained high across mand categories for both parents. Not only was the increase from baseline to training replicated across all three categories for each child, the results were replicated across children. This shows a clear functional relationship between the independent and dependent variables.

Data from this study supports previous research (Marckel, Neef, & Summer, 2006) indicating that children with autism can improvise using novel mands and parents can act as consistent implementers of procedures (Koegel, Symon & Koegel, 2002; Laski, Charlop. & Schreibman, 1988; Sueng, Ashwell, Elder & Valcante 2005).

Research Questions

This section analyzes the extent to which the results answered the research questions outlined in Chapter One.

To what extent does training using sufficient exemplars and differential reinforcement, as measured by the percentage of independent improvisations,

impact communication skills for children with autism?

Data were collected on the percentage of independent improvisations (novel mands) for each child diagnosed with autism across mand categories during this study. Both children, Myles and Cliff, displayed zero occurrences of independent use of novel mands during baseline with one exception. In session 5, Cliff displayed minimal use of novel shape mand. His mother, Maria, later explained that his grandmother began working with him on shapes the previous evening which may have influenced the results. However, it returned to zero the next day.

During training using sufficient exemplars and differential reinforcement, both children required many physical prompts from their parents to use the novel mands, especially for the first session in each mand category. The children would not respond or would grab for the preferred item until the parent provided hand over hand assistance to ensure success. Gradually, the children began to improvise independently using the color, shape and/or function of the preferred item. Although outliers existed for both Myles and

Cliff, the number of independent improvisations increased dramatically from baseline. Cooper, Heron and Heward (1987) state that outliers do exist but it is the trend line that is more important to visually examine progress.

An interesting point is Myles' refusal to start with training procedures each session. In the second mand category, he displayed challenging behaviors when training began. When his mother set up the materials for the probes, the challenging behavior stopped and he began to independently improvise. This occurred again in the third mand category. He began the sessions doing independent improvisations without the formal training per procedures. This supports Magiati and Howlin's (2003) research that displayed that children with autism can rapidly learn to use PECS.

Independent improvisations were replicated across the three mand categories and across the children indicating a clear functional relationship between the independent variable on the dependent variable. These findings support existing research on using sufficient exemplars and differential reinforcement on improvisation (Clark & Green, 2004; Duker & van Lent, 1991; Marckel, Neef & Summer, 2006). The results replicated the effects of the Marckel, Neef and Summer (2006) study which showed that children with autism could be taught to independently improvise using sufficient exemplars and blocked access.

<u>To what extent will the child participants use novel mands with untrained items?</u>

Generalization data were collected on the use of novel mands for untrained items. Generalization was assessed during baseline and all three mand categories. Both Myles and Cliff did not display any use of novel mands toward items not trained during baseline and Myles again did not display any generalization in the first mand category. However,

Cliff initiated novel mands (colors) to untrained items (toys in his playroom) correctly during the first mand category. Both Myles and Cliff generalized to untrained items in both the second (shapes) and third (functions) category. The increase, expansion and maintenance of generalization over the three mand categories indicate that children with autism can be taught to generalize the use of independent improvisations.

This study supplements Yoder and Stone (2006) research whereas results indicated that children with autism can learn to generalize well with PECS. This study's finding also supplements the literature on generalization of mands for children with autism (Drasgow, Halle & Ostrosky 1998; Hall & Sunberg, 1987; Yamamoto & Mochezuki, 1988) by replicating Marckel, Neef and Summers' (2006) study which showed that independent improvisations can be generalized to other untrained items.

To what extent can parents use sufficient exemplars and differential reinforcement to promote the use of novel requests for individuals who rely on pictorial communication?

Data were collected on the correct implementation of procedures by the parents, in this case, mothers. Results revealed that accurate implementation procedures remained at high levels (90%+) throughout baseline and training in all three mand categories for both parents. With high accuracy, the parent placed materials (novel line drawing cards, preferred and neutral objects) in front of the child, provided physical assistance for errors and non-responses, provided access for improvisations and reset each trial.

One parent, Dawn, did require brief training (30s-1 min) reviewing procedures before a few sessions (approximately 25%). This review primary consisted of the experimenter answering questions regarding mand category, position of materials, etc. This occurred more often towards the end of the study and may be attributed to the

mother's reported high stress levels since she and her husband filed for divorce during the early stages of the study. The other parent, Maria, did not require additional training within each mand category. This additional parent training supports Koegel, Symon and Koegel's (2002) research which shows that intensive pre-performance training and on-going review /feedback promote higher performance levels by parents providing interventions to their children.

The results of this study extend previous improvisation literature as clinicians act as the implementers even when in the child's natural environments (Clark & Green, 2004; Marckel, Neef, & Summer, 2006; Parsonson & Baer, 1978). Parents trained by the experimenter implemented the multiple baseline procedures in this study. This study's treatment integrity finding supports previous research on parents as implementers to promote generalization and maintenance (Bondy & Frost, 1992; Krantz, MacDuff, & McClannahan, 1993; Kuhn, Lerman, & Vorndran, 2003; Laski, Charlop, & Schreibman, 1988).

<u>To what extent do parents participating in the study value (per rating scale) the interventions and outcomes?</u>

Both parents, Dawn and Maria, rated the ease of interventions, value of the study's outcomes in the top numerical category. Dawn and Maria separately stated that they would continue to implement the procedures as they felt that the interventions were effective and they were happy with the results although for different reasons. Also, both rated the interventions were 'user-friendly'. Interventions that are easy to use helps bridge the research to practice gap that exists in the field of applied behavior analysis

Dawn stated that she was very excited about the unexpected improvisation verbalizations by Myles and she would continue the procedure to help expand and maintain his new verbalizations. Maria stated that she wanted to continue procedures and will begin to generalize the procedures across people, use of new trainers as he will be starting kindergarten next year. Also Maria has contacted the experimenter after the study indicating post study use of novel mands for trained and untrained items.

To what extent do significant others in the participant's life (parent's and child's) value the interventions and outcomes?

Cliff and Maria's significant others rated the outcomes as good. Bond, the husband and father, stated that although he did not quite understand the procedures of asking for black, round for cookie, he did like the outcome and believed it benefited Cliff. Bond also said that Cliff has begun to verbalize which is their ultimate goal. Cliff's teacher witnessed a generalization for ice cream in the school environment and immediately ran to find him one.

Adult significant others for Myles and Dawn were unavailable for consultation for social validity during the study, and access to his teacher was not available. Reportedly, this was due to the pending divorce. However, his older brother, 8, declared that it was "cool" and "wow" when his brother began to talk.

Anecdotal Outcome

Anecdotal verbalization data from Myles were collected. Figure 4.3 and Table 4.3 shows the total and number of words spoken by Myles during baseline and treatment conditions across mand categories. More two word phrases were displayed during the first mand category whereas more 5+ words were displayed in the third mand category.

Most of the novel mand verbal phrases were in conjunction with the use of the picture exchange communication system cards although his mother reported that he did request items outside of experimental sessions and without the use of the PECS cards. During experimental conditions he verbalized the novel mands. For example, in the mand category three (functions), when Myles wanted a specific kind of candy, he stated "I want red, yellow, green, square, eat." Although this is not a complete sentence, he lengthened his verbal phrases. His mother stated that linking more than 2 words to request an item was rare. He displayed verbal ability as he would sing songs or repeat nonsense phrases from the television but rarely used words in a functional manner. It was conveyed that he would grunt, grab someone's arm, scream, hit himself and/or sometimes ask for the item using one word utterances. Dawn, his mother, was excited when he began verbally linking the words. She related that he continued the use the novel verbal mand after the study ended. However, he did not generalize the verbalizations to others such as his sibling or teacher according to parent report.

These unexpected findings support the research on PECS and language development (Ganz & Simpson, 2004; Kravits, Kamps, Kemmerer, & Potucek, 2002; Preis, 2006). Results of Ganz and Simpson's (2004) study showed that children with autism rapidly increased word utterances and complexity when taught phases 1-4 of the picture exchange communication system. These results also generalized across people. Since PECS requires an exchange to request an item, not only can verbalizations increase but social interactions can increase and generalize across people and settings (Kravits,

Kamps, Kemmerer, & Potucek, 2002) This unforeseen outcome of the present study warrants further investigation such as examining the effects of training novel mands on verbalizations by children with autism.

Limitations of the Study

One limitation of the study was the experimenter's lack of expertise with electronic and digital materials. IRB required that the experimenter maintain confidentiality by videotaping sessions and transposing them to digital form (computerized). Although the experimenter had been trained by experts in these areas, a few of the videos were partial and required live data collection and digitized segments were cut off or of medium quality. This lack of expertise lengthened IOA and treatment integrity procedures since videos had to be viewed several times. Also, the lack of videotape for all sessions may decrease the reliability of the study since some sessions cannot be accessed to compare results. Another limitation involving the videotape was the children's reactivity to the taping of the sessions. The children displayed challenging behaviors until the videotape was turned off, then they would cooperate with the parent.

A third limitation was a clear response definition for challenging behaviors. The current definition required that a non-response be documented whereas if a functional assessment had been conducted, the challenging behavior might actually be an incorrect response. Too, it could be scored separately to denote that it was not an appropriate independent improvisation, even though, it may have served the same function.

A third limitation was the number of participants. Only two children and their mothers participated in the study; a third set (child and parent) was unavailable. Due to the rural nature of southern West Virginia, it was difficult to locate families who met the

criteria for participation in the study. More participants lead to greater potential of generalization to other children with autism who use the picture exchange communication system.

A fourth limitation was the interventions were delivered by stay-at-home mothers. If this study was implemented by working moms, the procedural integrity may not be as high due to other variables such as time constraints or distractions, work related events and stressors, etc. Future research might be strengthened by examining the effects if the procedures were implemented by other family members (e.g., working moms, dad, siblings, extended family), and diverse families in other geographic regions.

The final limitation of the study was geographical distance. The participants lived approximately 1 hour from the experimenter and 1 hour from each other (adjacent rural counties). Due to weather conditions (e.g., snow, ice), mountainous roads, holidays (e.g., Thanksgiving, Christmas and New Year), illness, and family commitments, the time between sessions varied from a day to 2 weeks. The results may have been more robust if sessions were conducted on a consistent schedule. In addition, the number of sessions could have been extended to examine maintenance.

Implications for Practice

This study indicates that parents can implement procedures using blocked access and sufficient exemplars to teach the use of novel mands to request items with their children with autism. It also suggests that children with autism can be taught how to improvise and generalize across items. This study indicates that children can also generalize across people and environments. Since variability in communication is a necessary problem solving skill, this variability can lead the child with autism to increase

his options as he would be able to request that 'cookie' even if the existing picture was not available. The implementation of these procedures ultimately may increase the child's independence and may decrease his alternative forms of communication (e.g., grabbing an arm, grabbing items, hitting, screaming).

The use of a natural environment lends to potential generalization and maintenance in other natural environments. Since the implementer was the parent who can traverse various natural environments with her child, the novel mands could be used in the community and school. Families, not only the child, are affected by autism, therefore it is important to work with the family as a whole and include them as part of the procedures (Hutton & Caron 2005). The procedures implemented by the parent were not only successful for the child but for the parent as well. The parents were part of the process and not the bystanders. This research indicates that parents should be an integral part of their child's educational development program.

Since parents rated these procedures as user-friendly, the successful outcomes of this study could be generalized to other environments and across implementers. Per the successful outcomes of this study, parents do not need college degrees to implement the procedures. Parents, teachers and practitioners can easily use the procedures for children with autism to increase their improvisation communication skills for children who use PECS.

Direction for Future Research

This line of research lends itself to several suggestions for future research. As Marckel, Neef, and Summer (2006) point out, one study for future research would be to determine the extent which the novel mands (colors, shapes, and functions) are used by

children with autism who use the picture exchange communication system if the existing mand (picture of the item) is also available. However, this experimenter would also suggest that the implementer be the parent or teacher/practitioner.

Another study could address the thinning of the reinforcement, to address whether the novel mands could be maintained under various reinforcement conditions, specifically, thinning conditions of reinforcement. Thinning schedules of reinforcement is necessary to duplicate the natural environments as all requests are not reinforced. This could extend the previous research on reducing schedules of reinforcement and the use of extinction on maintenance of newly developed skills (Hagopian, Kuhn, Long, & Rush, 2005; Kelley, Lerman,& Van Camp 2002).

Another suggestion for future research is a longitudinal study to address the social outcomes of this study. This study could answer whether teaching novel mands actually made a difference in the life of a child with autism. The study could investigate whether the child with autism continued to use the novel mands (through PECS or verbally) to request items 6 months, 1 year and 2 years after the initial study.

Due to the anecdotal outcome for one of the participants, another suggestion for extension would be to assess the effects of teaching the use of novel mands to children with autism who use the picture exchange communication system and who displays emerging speech on functional verbalizations (speech).

A final suggestion would be to broaden this study by examining the effects of improvisation on other populations (e.g., developmentally disabled, severe language delays, etc.) who display severe language delays and use the picture exchange communication system.

Summary

Children with autism who use PECS can communicate to others using corresponding pictures (picture of a cookie). However, as they move into new environments and are exposed to new things, their ability diminishes due to the lack of available corresponding cards. This study displayed an effective means to mand for items by blocking access and sufficient exemplars, to expand their communication vocabulary. Also expanded was generalization of communication (improvised mands).

The present study also displayed the ability of parents to implement procedures across a multiple baseline design. The high levels of accuracy and reported ease of use may entice other parents to use of newly developed strategies to address their child's communication needs. This successful study supports existing research on improvisation, generalization of mands and parent implemented procedures.

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APPENDIX A

PARENT/GUARDIAN CONSENT FORMS

Script for Call or E-mail to Parents/Guardians

"Hi, my name is Delia Ben Chaabane and I am a doctoral student at The Ohio State University. Currently, I am working on my dissertation regarding training parents to evoke novel behavior using PECS. This study will be conducted in your home and requires participation from both yourself and your child. The sessions will be videotaped. This is to confirm your interest in participation in the study. Are you still interested? If so, I will be e-mailing you a letter that describes the study in more depth and consent forms.

The study will employ strategies for parents to facilitate the use of novel descriptor pictures to mand (request) a preferred item. Otherwise, instead of always using the same picture to request and item, the child could also request it by describing the item.

Should you have any questions, please do not hesitate to contact me at 304-384-9037 or dbenchaabane@hotmail.com. Thank you for your interest and I look forward to working with you."

MEET AND GREET

After the initial phone call, experiment met with families to build rapport and attain signatures on the consent forms.

Rapport building included the following:

- listening to the parents even if not associated with the study
- playing with the child
- discussion of local current events
- discussion of difficulties raising children (experimenter is also a parent)
- discussion of the additional issues of raising a child with autism (experimenter has a family member who is on the autism spectrum)
- discussion of similarities in lives (church, organizations, local schools, etc.)

After built some rapport with the families, attained signatures on the consent forms and scheduled sessions for the study.

The Ohio State University Parental Permission
For Child's Participation in Research

Study Title:	**The effects of parent training on improvisation of mands by children with autism**
Researcher:	**Sheila Alber Morgan**
Sponsor:	

This is a parental permission form for research participation. It contains important information about this study and what to expect if you permit your child to participate.

Your child's participation is voluntary. Please consider the information carefully. Feel free to discuss the study with your friends and family and to ask questions before making your decision whether or not to permit your child to participate. If you permit your child to participate, you will be asked to sign this form and will receive a copy of the form.

Purpose:
The purpose of the study is to examine whether children with autism can be taught to improvise using characteristics of a preferred item by their parents. It will extend existing research on improvisation and parent training.

Procedures/Tasks:
**Parents will complete questionnaire on skills and reinforcers (preferred items)
**Children will complete basic assessment on matching colors, shapes, functions
**Children will complete a reinforcement assessment (direct observation to see what they like)
**Parents will be trained before implementation of strategies (how to potentially facilitate the improvisations)
**Parents will implement strategy of facilitating strategies (teaching the child how to use the characteristics through discrimination training per the Picture Exchange Communication System) Parents are already using PECS with their children.
**Data will be collected by reviewing video tapes

Duration:
The study should last no more than 6 weeks.
Your child may leave the study at any time. If you or your child decides to stop participation in the study, there will be no penalty and neither you nor your child will lose any benefits to which you are otherwise entitled. Your decision will not affect your future relationship with The Ohio State University.

Risks and Benefits:
Risks: We do not anticipate any risks, side effects, or discomforts.

Benefits: Your child will have additional opportunities to learn new ways to communicate to others using PECS (Picture Exchange Communication System). In addition, your child will have more opportunities to interact/communication with their parents.

Confidentiality: Efforts will be made to keep your child's study-related information confidential. However, there may be circumstances where this information must be released. For example, personal information regarding your child's participation in this study may be disclosed if required by state law. Also, your child's records may be reviewed by the following groups (as applicable to the research):

- Office for Human Research Protections or other federal, state, or international regulatory agencies;
- The Ohio State University Institutional Review Board or Office of Responsible Research Practices;
- The sponsor, if any, or agency (including the Food and Drug Administration for FDA-regulated research) supporting the study.

Incentives:
Neither you nor your child will be paid to take part in the study.

Participant Rights:
You or your child may refuse to participate in this study without penalty or loss of benefits to which you are otherwise entitled. If you or your child is a student or employee at Ohio State, your decision will not affect your grades or employment status.
If you and your child choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By signing this form, you do not give up any personal legal rights your child may have as a participant in this study.
An Institutional Review Board responsible for human subjects research at The Ohio State University reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and University policies designed to protect the rights and welfare of participants in research.

Contacts and Questions:
For questions, concerns, or complaints about the study you may contact Sheila Alber Morgan at 614-247-8714

For questions about your child's rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact Ms. Sandra Meadows in the Office of Responsible Research Practices at 1-800-678-6251.

If your child is injured as a result of participating in this study or for questions about a study-related injury, you may contact Sheila Alber Morgan at 614-247-8714
Signing the parental permission form

I have read (or someone has read to me) this form and I am aware that I am being asked to provide permission for my child to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to permit my child to participate in this study.

I am not giving up any legal rights by signing this form. I will be given a copy of this form**.**

I agree to videotaping and photos.

Printed name of subject			
Printed name of person authorized to provide permission for subject		**Signature of person authorized to provide permission for subject**	
			AM/PM
Relationship to the subject		**Date and time**	

Investigator/Research Staff

I have explained the research to the participant or his/her representative before requesting the signature(s) above. There are no blanks in this document. A copy of this form has been given to the participant or his/her representative.

Printed name of person obtaining consent		**Signature of person obtaining consent**	
			AM/PM
		Date and time	

The Ohio State University Consent to Participate in Research

Study Title:	**The effects of parent training on improvisation of mands by children with autism**
Researcher:	**Sheila Alber Morgan**
Sponsor:	

This is a consent form for research participation. It contains important information about this study and what to expect if you decide to participate.

Your participation is voluntary.

Please consider the information carefully. Feel free to ask questions before making your decision whether or not to participate. If you decide to participate, you will be asked to sign this form and will receive a copy of the form.

Purpose:
The purpose of the study is to examine whether children with autism can be taught to improvise using characteristics of a preferred item by their parents. It will extend existing research on improvisation and parent training.

Procedures/Tasks:
**Parents will complete questionnaire on skills and reinforcers (preferred items)
**Children will complete basic assessment on matching colors, shapes, functions
**Children will complete a reinforcement assessment (direct observation to see what they like)
**Parents will be trained before implementation of strategies (how to potentially facilitate the improvisations)
**Parents will implement strategy of facilitating strategies (teaching the child how to use the characteristics through discrimination training per the Picture Exchange Communication System) Parents are already using PECS with their children.
**Data will be collected by reviewing video tapes

Duration:
The study should last no more than 6 weeks.
You may leave the study at any time. If you decide to stop participating in the study, there will be no penalty to you, and you will not lose any benefits to which you are otherwise entitled. Your decision will not affect your future relationship with The Ohio State University.

Risks and Benefits:
Risks: We do not anticipate any risks, side effects, or discomforts.
Benefits: You will have opportunities to teach your child new ways to communicate to others using PECS (Picture Exchange Communication System). In addition, you will have more opportunities to interact/communication with your child.

Confidentiality: Efforts will be made to keep your study-related information confidential. However, there may be circumstances where this information must be released. For example, personal information regarding your participation in this study may be disclosed if required by state law. Also, your records may be reviewed by the following groups (as applicable to the research):

- Office for Human Research Protections or other federal, state, or international regulatory agencies;
- The Ohio State University Institutional Review Board or Office of Responsible Research Practices;
- The sponsor, if any, or agency (including the Food and Drug Administration for FDA-regulated research) supporting the study.

Incentives:
You will not be paid to take part in the study.

Participant Rights:

You may refuse to participate in this study without penalty or loss of benefits to which you are otherwise entitled. If you are a student or employee at Ohio State, your decision will not affect your grades or employment status.
If you choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By signing this form, you do not give up any personal legal rights you may have as a participant in this study.
An Institutional Review Board responsible for human subjects research at The Ohio State University reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and University policies designed to protect the rights and welfare of participants in research.

Contacts and Questions:
For questions, concerns, or complaints about the study you may contact Sheila Alber Morgan at 614-247-8714

For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact Ms. Sandra Meadows in the Office of Responsible Research Practices at 1-800-678-6251.

If you are injured as a result of participating in this study or for questions about a study-related injury, you may contact Sheila Alber Morgan at 614-247-8714

Signing the consent form

I have read (or someone has read to me) this form and I am aware that I am being asked to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to participate in this study.

I am not giving up any legal rights by signing this form. I will be given a copy of this form**.**

I agree to videotaping and photos.

Printed name of subject		**Signature of subject**	
			AM/PM
		Date and time	
Printed name of person authorized to consent for subject (when applicable)		**Signature of person authorized to consent for subject (when applicable)**	
			AM/PM
Relationship to the subject		**Date and time**	

<u>Investigator/Research Staff</u>

I have explained the research to the participant or his/her representative before requesting the signature(s) above. There are no blanks in this document. A copy of this form has been given to the participant or his/her representative.

Printed name of person obtaining consent		**Signature of person obtaining consent**	
			AM/PM
		Date and time	

APPENDIX B

PRE-EXPERIMENTAL ASSESSMENT FORMS

PREFERENCE QUESTIONNAIRE

Child's name: Person completing the form:

1. Name 10 items that your child likes to eat.

2. Name any items that your child does not like to eat.

3. Name 10 items that your child likes to play.

4. Name any items that your child does not like to do.

5. Name 10 items that your child likes to drink.

6. Name any items that your child does not like to drink.

7. Name 10 items that your child likes to touch.

8. Name any items that your child does not like to touch.

9. Name 10 sounds that your child likes to hear.

10. Name any sounds that your child does not like to hear.

11. Name 10 items that your child likes to smell.

12. Name any items that your child does not like to smell.

REINFORCEMENT HIERACHY

Child:

Category	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Eat										
Drink										
Play										
Touch										
Smell										
Hear										

SKILLS QUESTIONNAIRE

Child's name: Person completing the form:

1. Can your child match his colors? Yes No

2. If yes, list the colors that your child can match.

3. List any colors that your child cannot match.

4. Can your child match his shapes? Yes No

5. If yes, list the shapes that your child can match.

6. List any shapes that your child cannot match.

7. Can your child match his functions? Yes No
For example: match food to eat, toys to play, liquid to drink, etc.

8. If yes, list the functions that your child can match.

9. List any functions that your child cannot match.

SKILLS ASSESSMENT—DIRECT OBSERVATION

Child:

Category								
COLOR	RED	YELLOW	BLUE	GREEN	WHITE	BLACK		
SHAPE	CIRCLE	SQUARE	RECTANGLE	TRIANGLE	OVAL	LINES		
FUNCTION	EAT	DRINK	PLAY	WATCH	READ	LISTEN		

CIRCLE IF YES, PLACE AN (X) IF NO.

APPENDIX C

DATA COLLECTION FORMS

BASELINE, TREATMENT & GENERALITY PROBES
DATA COLLECTION FORMS for CHILD

Child: _____
Session: _____

BASELINE
TREATMENT 1 2 3
GEN. PROBE

TRIAL	RESPONSE	COMMENTS
1	C: N E I	
	S: N E I	
	F: N E I	
2	C: N E I	
	S: N E I	
	F: N E I	
3	C: N E I	
	S: N E I	
	F: N E I	
4	C: N E I	
	S: N E I	
	F: N E I	
5	C: N E I	
	S: N E I	
	F: N E I	
6	C: N E I	
	S: N E I	
	F: N E I	
7	C: N E I	
	S: N E I	
	F: N E I	
8	C: N E I	
	S: N E I	
	F: N E I	
9	C: N E I	
	S: N E I	
	F: N E I	
10	C: N E I	
	S: N E I	
	F: N E I	

Percentages: N _____ I _____ E: _____

Mark N (non response), E (error) or I (improvisation) for color, shape and function

PERCENTAGE OF INTEROBSERVER AGREEMENT (IOA)
FOR CHILD

Child: _____ Parent: _____

Session	Agree	Disagree	Percentage of IOA

APPENDIX D

PARENT TRAINING AND

PROCEDURAL INTEGRITY

PARENT TRAINING

1. Provide parent with treatment integrity form for the phase being trained.

2. Demonstrate how to complete each step of the phase while providing verbal direction at least twice. Ask parent if they are ready to practice the steps.

3. Practice the steps with the parents. Respond differently to allow the parents to practice for the child's various responses. Provide verbal direction as necessary.

4. When parents state they are ready, ask them to demonstrate implementation of the phase without verbal prompting.

5. Document completion of steps using data collection forms…..repeat until reach 90% for 3 consecutive trials.

BASELINE DATA COLLECTION FORMS for PARENTS

Child: _____ Parent: _____ Session: _____

		Tr. 1	Tr. 2	Tr. 3	Tr. 4	Tr. 5	Tr. 6	Tr. 7	Tr. 8	Tr. 9	Tr. 10
1	Parent provided preferred item and corresponding picture	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
2	Parent placed materials in front of the child	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
3	If child manded for the item using the picture, the parent provided immediate access to item (small piece or short time)	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
4	Parent removed the corresponding card	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
5	Parent provided descriptor and distracter pictures	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
6	Parent placed new cards in book/table in front of the child as well as the preferred item	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
7a	If child used a correct descriptor card:										
	**Child given immediate access	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
	**Different item and cards (descriptor and distracter card placed in front of child	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
	**If correct response, short access provided	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
	**Ended session	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
7b	If child did not attempt, or did not use correct card:										
	**Reset pictures closer to object---no verbal cue provided by parent	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
	**After two non-response or attempts, parent placed different item and descriptor and distracter cards in front of child.	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
	**If no attempt, reset.	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
	**If still no attempt, ended session.	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N