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A comparison of morphophonic faces and the picture exchange communication system on the production of verbal communication in preschoolers with autism

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A COMPARISON OF MORPHOPHONIC FACES AND THE PICTURE EXCHANGE COMMUNICATION SYSTEM ON THE PRODUCTION OF VERBAL COMMUNICATION IN PRESCHOOLERS WITH AUTISM

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ABSTRACT

Children with Autism Spectrum Disorder (ASD) exhibit difficulties with both verbal and nonverbal language with approximately 50% of children diagnosed with autism remaining functionally mute into adulthood (Charlop & Haymes, 1994; Charlop-Christy, Carpenter, Le, LeBlanc, & Kellet, 2002). This study explored intervention using the Picture Exchange Communication System (PECS) for two nonverbal preschoolers with ASD. The effects of PECS using two picture systems, Picture and Words (P&W) and MorphoPhonic (MPh) picture word, was assessed in the communicative outcomes after 6 weeks of intervention. This study asked if MPh picture words would elicit more picture-exchange communication acts in functional contexts than P&W and if MPh picture words would elicit a greater number of verbal communications than pictures accompanied by words. The results suggest that changes in communication can be observed in 6 weeks of intervention. Greater gains were also observed in the MPh picture word condition over the P&W condition.

CHAPTER ONE
INTRODUCTION

Autism is a complex neurological disorder with a range of presenting problems, but a defining characteristic is poor communication skills (Rao & Gagie, 2006). Children with autism present difficulties with both verbal and nonverbal communication that persist into adulthood. Approximately 50% of children diagnosed with autism will remain functionally mute in adulthood (Charlop & Haymes, 1994; Charlop-Christy, Carpenter, Le, LeBlanc, & Kellet, 2002). Those who do acquire speech have difficulty with social communication and many aspects of language (American Speech-Language Hearing Association, 2006; Garfinkle & Schwartz, 2002). In addition, few individuals with autism acquire more than rudimentary written language skills, or they demonstrate word calling without meaning (i.e., hyperlexia) (ASHA, 2006; Nation, Clarke, Wright, & Williams, 2006; Newman, Macomber, Naples, Babitz, Volkmar, Grigorenko, 2007). To provide children with a functional communication system, pictures have been used with positive outcomes (Charlop-Christy, et al, 2002; Ganz & Simpson, 2004; Kravits, Kamps, Kemmerer, & Potucek, 2002; Sigafoos, Ganz, O'Reilly, Lancioni, & Schlosser, 2007; Yoder & Stone 2006). However, picture communication has many limitations, and so it would be desirable to facilitate a child's use of a more conventional mode of communication, such as oral and/or written language, from the earliest stages of communication development. This study will compare the use of pictures accompanied by printed words versus printed words incorporating picture and sound cues (i.e., MorphoPhonic picture words) (Norris, 2006) for their relative effects on nonverbal and verbal communication abilities with two non-speaking children exhibiting characteristics of autism.

CHAPTER TWO
REVIEW OF LITERATURE

Communication Challenges in Autism

Autism is a complex and multivaried disorder, so that there is no one profile of autism. In recognition of this, the American Psychological Association has identified a spectrum of disorders that fall under the umbrella of autism. Included within the Autism Spectrum Disorder (ASD) are autism, Asperger syndrome, and pervasive developmental disorder not otherwise specified (PDD-NOS), a diagnosis assigned when criteria for a more specific disorder are not met but traits are present. Generally, the type, number and/or severity of autistic traits correspond with the severity of autism in the individual.

Autism is distinguishable from other childhood developmental disorders through deficits in social communication. Communication can often be challenging for children with autism because they lack abilities such as engaging in social interaction, social reciprocity, language and related cognitive skills, and behavior and emotional regulation (ASHA, 2006). While some children respond to intervention using verbal communication, others fail to acquire verbal language or they produce speech without communicative intent (Bondy & Frost, 2001). As an alternative, success has been shown for many of these children using nonverbal, or AAC (Augmentative and Alternative Communication) communication such as manual sign or picture-based communication boards. While manual sign is a successful modality for some, Ganz and Simpson (2004) reported that with individuals with ASD, picture-based AAC systems are used more frequently and more successfully due to a match between the characteristics of ASD and the ease of using a picture-based AAC system. The picture symbols are consistent with the visual cognitive style characteristic of individuals with autism (Grandin, 1995), and providing a concrete means for understanding the meaning and process of communication.

The Picture Exchange Communication System

One form of picture-based AAC, The Picture Exchange Communication System (PECS), was developed to promote functional communicative in individuals with autism (Bondy & Frost, 1998). In this program children are trained to exchange a picture of an item with a communicative partner to obtain the desired object. PECS allows the user to communicate functionally while initiating a socially based interaction; both of which are primary communication deficits found in individuals with autism. The child is trained over 6 phases to make increasingly more linguistically and socially complex exchanges. The goals of these phases include: making an initial exchange (Phase I), making a request to a distant communicative partner (Phase II), discriminating between multiple pictures (Phase III), making requests in sentence form (Phase IV), using pictures to respond to "What do you want?" (Phase V), and at Phase VI, spontaneously commenting and expanding on previously acquired communications. In this manner, the learner systematically increases the range of communicative partners and settings, length of utterances, and types of communicative functions.

Charlop-Christy, et al. (2002) examined the effects of PECS training on speech production in free-play and academic settings for 3 male children with autism, ranging in age from 3;8 to 12;0. At the initiation of the program, participants did not speak or rarely spoke. A single-subject experimental design was used to assess the training time required for mastery of PECS skills, the effects of PECS training on behavior, and the effects on social-communicative behavior through spontaneous and imitative speech during PECS training. Results indicated that all 3 children met the criterion for each PECS phase (80% correct for each phase) and acquired PECS skills in an average of 170 minutes, or approximately 246 trials. Each subject increased the frequency of spontaneous and imitative speech produced during free play and academics.

The research further found that participants' social-communicative behaviors also increased. A one-year follow-up showed these gains were maintained.

Yoder and Stone (2006) compared the efficacy of two AAC systems for facilitating spoken language and non-imitative word use in preschoolers with autism spectrum disorders (ASD). Thirty-six children between the ages of 30-36 months were divided into two treatment groups: the Responsive Education and Prelinguistic Milieu Teaching (RPMT) group and the Picture Exchange Communication System (PECS) group. Results immediately following the intervention showed greater gains in both spoken language and non-imitative word use for the PECS intervention. However, at 6-months post-treatment the effects of PECS training were not maintained. Upon further investigation, Yoder and Stone (2006) deduced that overall treatment efficacy relied on the initial object exploration level of the participants. The PECS experimental group maintained growth 6-months post-treatment if they demonstrated high object exploration before treatment began. On the contrary, if participants began treatment with low object exploration, then RPMT facilitated a higher generation of non-imitative words 6-month post-treatment. Yoder and Stone (2006) concluded that these findings are beneficial for matching treatment options to the individual characteristic of children with ASD.

Ganz and Simpson (2004) studied the effects of PECS on requesting and speech development in 3 children with ASD and developmental delays. The participants, ranging from 3;9 to 7;2 years, produced 0-10 single word utterances functionally at the initiation of the study. Each participant mastered four levels of PECS training in less than 2 months. All 3 subjects produced a greater number of words. Moreover, each participant completed PECS Phase IV, speaking in 3-4 word phrases. However, even though each participant used longer verbal utterances by the end of the study, each participant still produced non-word vocalizations but with lower frequency once they had a verbal repertoire. The study demonstrated that picture

symbols did not inhibit, but rather facilitated functional speech and longer utterances in children with ASD.

Tincani (2004) compared the use of manual sign language to PECS for two children with autism, aged 5;10 and 6;8 years. This study utilized an alternating treatment design with both treatments rotated throughout the duration of the research. Results of the study were mixed. PECS training required fewer hand-motor productions to teach communication than sign. However, each participant produced more speech during the sign language intervention. Further, the phases of PECS training were modified for one participant during this research due to a decline in communication during a PECS phase. Tincani (2004) concluded that PECS was effective, but the modification of PECS was a contributing factor to increased verbal production later in the study.

Kravits, Kamps, Kemmerer, and Potucek (2002) examined the effects of PECS compared to no enhanced communication with a 6 year old girl with autism in her home and school settings. Results showed increases in spontaneous requests and comments using both pictures and verbalizations in the settings where PECS were used. Increases in intelligible verbalizations were shown in two of the three PECS settings, and more peer social interactions were observed in one of the two school settings.

A growing body of single-subject studies indicates that picture symbols, taught within the PECS phases, are effective in increasing the communicative abilities of children with autism. However, picture symbols have many limitations. While the meaning and communicative intent of a picture may be clear for simple requests of concrete objects, they are increasingly ambiguous as the complexity and abstraction of the message increases. The message communicated using pictures is largely limited to the immediate context. Further, picture

symbols do not prepare children for reading. These limitations suggest the need to explore picture symbols that incorporate print as a mode of communication.

Pictured Words Versus Words With Pictures

PECS is a picture exchange communication system, but the selection of picture type is at the discretion of the interventionist. As with other AAC systems, the pictures used with PECS may be photographs, colored drawings, black and white line drawings, or even miniature objects (Miranda, 1985). The recommendation is that the type and size of picture representation depend on the abilities and needs of the person using PECS (Bondy & Frost, 1985; Miranda & Locke, 1989). A review of the extant literature revealed no studies comparing different picture types for children with autism or other nonverbal populations. Further, no studies specifically addressing the presence of print accompanying pictures for children of autism were found, although there is a body of literature for typically developing children.

Studies in emergent literacy show that pictures are an important cue used by children to discover the communicative function of print. Ehri (1995, 2007) profiled the development of printed word recognition from emergent to fluent stages. The pre-alphabetic stage of reading is characterized by attention to pictured information rather than print. Young children first ignore the print and "read" the illustration in a book. Also during this time, young children read words using logos or other context, such as the golden arches on the brand name "McDonalds." A slightly more sophisticated picture strategy is seen when children read words by an idiosyncratic visual feature of the word, such as apparent eyeballs on the word "look" or humps on the word "camel." Only gradually does a child's attention begin to focus on the alphabetic properties of letters. Ehri's research suggests that pictures are an important communication symbol system for young children, and that when accompanied by print, they provide a scaffold for beginning to discover the meaning and function of print.

Several researchers explored whether the use of pictured information could be productively used to facilitate actual word recognition among beginning readers. Two studies explored the effects of making the relationship between pictures and print explicit, with contradictory results. Lang and Solman (1979) found an advantage for pictures that were closely related to the word compared to unrelated pictures or plain words. However, Solman and Wu (1995) failed to replicate these results, finding a no picture condition superior to learning words with pictures. In a follow-up study, Solman, Singh, and Kehoe (1992) compared word learning with and without pictures, changing the salience by varying the size of the pictures and print. Results showed that twice as many words were learned in the no picture condition and that print and/or picture size made no difference. In a subsequent study, Wu and Solman (1993) showed that words with pictures could be learned as well as words without pictures if the pictures were used to give children feedback on the accuracy of their word recognition, but they did not enhance word learning. Pictured words presented without feedback resulted in the fewest words learned as in the earlier studies.

Tabe and Jackson (1989) randomly assigned 16 intellectually disabled nonreaders aged 9;0 through 13;8 years to conditions where words were either juxtaposed next to pictures or superimposed into the picture. Words were trained for four consecutive days. Results showed that more words were learned when the print was superimposed into the picture. They concluded that the superimposed position of the word in the picture directed the learner's attention to the word, and that the picture provided a direct link to the pronunciation and meaning of the word. Blischak and McDaniel (1995) compared similar words, termed "enhanced words" that exploited idiosyncratic visual feature of the word, such as apparent eyeballs on the word "look," to printed words and words accompanied by pictures. Kindergarten-aged children were trained for four consecutive days, at the end of which they recognized more words that had been taught using the

enhanced pictures. They concluded that although the enhanced words were beneficial, they are limited to use with concrete words and may not help children learn to recognize untrained words.

McInnis (2008) used a variation of enhanced words termed MorphoPhonic Faces (MPh) (Norris, 2006). These words superimpose pictures into the print to provide meaning cues, but that also cue the child to the alphabetic principle of words (see Figure 1). The words are pictured by illustrating a face producing the initial letter-sound (e.g., the letter "p" drawn as the top lip on the face producing the /p/ sound) while the remainder of the letters incorporate pictures of the meaning (morphemes), similar to enhanced words (Norris, 2006). The letter-sound iconically pictured in the face is designed to cue both speech production and alphabetic knowledge, an outcome that was achieved with both severely motorically impaired children (Banajee, 2007) and typically developing toddlers (Terrell, 2007). Banajee's data suggested that the pictured letter-sound cue did help children discover the alphabetic principle for word recognition, and also elicited verbalizations. It was proposed that the additional meaning cue provided by the MPh picture words would enable the child to maintain a focus on the meaning, and thus the pronunciation of the word simultaneous with the alphabetic information. McInnis found that following 18 sessions, two year old toddlers were able to read printed words and recognized more words that had been taught using MPh picture words than plain print. Powell, Hoffman, and Norris (2007) also found more rapid word learning for MPh picture words compared to printed words for low-ability readers.

Kaufman, Norris, and Hoffman (2007) used MPh picture words as stimuli to prompt verbalizations from a non-speaking child who was 3;8 at the initiation of the study. This subject's receptive language skills were within the average range, while expressive skills were <1 percentile on the Preschool Language Scale-3 (Zimmerman, Steiner, & Pond, 1992). During the first session, 20 word imitations were elicited using the MPh picture words, and by the

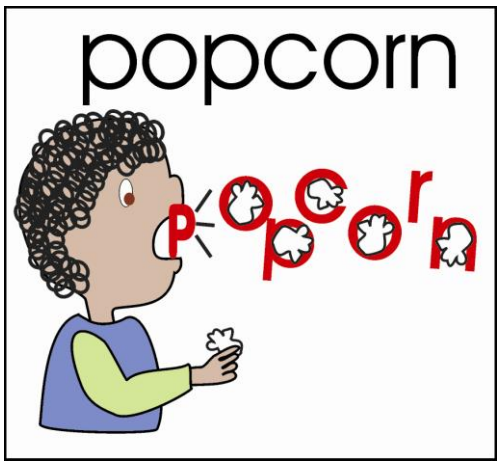


Figure 1 MorphoPhonic picture word where first letter is drawn as a face producing the relevant sound and the meaning is depicted by pictures incorporated into the letters.

3rd session 5 words previously imitated were spontaneously produced. Across 9 weeks of treatment, 20-92 imitated words were produced in each session. A continuous increase in spontaneously produced words also was seen, from 5 in session three to 71 in session nine. At the end of nine weeks, the child had over 132 recognizable expressive words in his vocabulary including nouns, verbs, and adjectives used in two-word utterances. Although no control condition was used, this study suggests that the MPh picture words may be used effectively to elicit speech from nonverbal preschoolers. Although not specifically explored, the MPh words may also have the added advantage of exposing children to print in a meaningful and functional manner from the earliest stages of language acquisition.

To explore whether MPh picture words would also prompt communication from nonverbal preschoolers with Autism Spectrum Disorder, this study compared the use of MPh picture words to pictures accompanied by words as the picture stimuli within PECS. The specific questions of the study were:

1. Do MPh picture words elicit more picture-exchange communication acts in functional contexts than pictures accompanied by words?

2. Do MPh picture words elicit a greater number of verbal communications than pictures accompanied by words?

CHAPTER THREE
METHODS

Two children who were essentially nonverbal were compared for the use of PECS with 2 types of picture and word symbols in a single-subject design. Each subject received 6 weeks of instruction with picture symbols accompanied by words (pictures and words) (P&W) and written words superimposed into pictures that profiled sound and meaning in the picture cues (i.e., MPh words). Both picture symbols were incorporated into play activities using PECS procedures. Subjects were evaluated for total communicative attempts, further specified as nonverbal communications and verbal communications (spontaneous versus imitative).

Participants

The participants of this study were 2 children participating in the LSU Speech and Language Preschool program. At the commencement of the study, Participant A was 3;11 years of age and Participant B was 4;10 years of age. Participants were selected on the basis of being nonverbal (e.g., having fewer than 20 spontaneously used words and/or initiating fewer than 5 spontaneous verbal communications in 20 minutes) and residing in a home where English is the primary language spoken. Participants did not have any known hearing, vision, or motor impairment that impeded the ability to see and manipulate small picture cards.

Each subject was administered a test battery at the beginning of the study comprised of the *Autism Diagnostic Observation Scale* (ADOS, 2003); Hearing, Vision, and Motor Skills evaluation; *The MacArthur Communicative Development Inventory: Words and Gestures* (CDI, 1993); and the *Critical Communication Skills Checklist* (Frost & Bondy, 2001).

Test Battery

The ADOS is a semi-structured and standardized assessment of communication, social interaction, and play for individuals who exhibit characteristics of autism spectrum disorders.

Table 1

Characteristics of Participants A and B including Chronological Age (CA), Diagnosis, Performance Level on the MacArthur Communicative Development Inventory: Words and Gestures (MacArthur), and Performance Level on the Preschool Language Scale – Fourth Edition (PLS-4)

			MacArthur			PLS-4	
Participant	CA	Diagnosis	Understands clinician/parent	Produces clin/parent	Gestures clin/parent	Auditory Comp	Expressive
A	3;11	Autism	20%/62%	24%/38%	24%/78%	31 months	21 months
B	4;10	ASD (ADOS)	56%/40%	4%/ 1%*	54%/59%	NA	NA

*Produced using manual sign

The examiner selects one of four modules with a variety of activities designed for use with children or adults. Participant A was clinically diagnosed with Autism Spectrum Disorder, therefore administration of the ADOS was not necessary as this clinical diagnosis already met the inclusionary criteria. The graduate clinician for Participant B administered Module 1: Pre-Verbal/Single Words. Within this module, the clinician looked for spontaneous initiation of interactions by the child, the level that the child explores materials (symbolic or functional), and the length of time the child attends to objects. Results for Participant B revealed that his total scores were within the range of Autism Spectrum Disorder. This finding indicates that Participant B exhibits deficits in social interaction and communication similar to those with Autism Spectrum diagnoses.

The Louisiana State University (LSU) Speech, Language, and Hearing Clinic parent questionnaire was used to determine if there are or have been any concerns regarding sensory and motor skills. A hearing screening was conducted on both participants at the beginning of the study whereby hearing acuity was judged to be within normal limits. In addition, two 30-minute observations were made to determine if the subject responded visually to small objects and

auditorily to sounds in the immediate environment. Responses to both visual objects and sounds were appropriate and no acuity problems were suspected for either subject.

The CDI is an inventory of early words and communicative gestures completed by the parent or other person familiar with the child. Parents completed the CDI by recording any words or communicative gesture understood or produced by their child. The clinician working with the child also recorded any words or gestures responded to or produced by the child at the beginning and ending of the intervention.

The parents reported that Participant A understood 62% of the words listed on the CDI vocabulary checklist and produced 38% of these words. Participant A's clinician reported that he understood 20% and produced 24% of the words that he understood. The parents responded that Participant A used 78% of the total gestures (i.e. points to interesting object) listed; however, the clinician reported that he only used 24% of the early gestures.

The parents for Subject B revealed that he understood 40% of the words on the vocabulary checklist and produced 1% of these words through sign. Similarly, the clinician reported that he understood 56% and produced 4% of the words on the vocabulary checklist. Subject B's parents reported that he used 59% of the total gestures listed; likewise, the clinician's response was 54% total gestures used.

Critical Communication Skills Checklist (Frost & Bondy 2001) included parent interview, observation in the preschool setting, and direct assessment by the clinicians which were used to complete the checklist. Items on the checklist included being able to request items, assistance or a break, rejecting, and responding to directions. Results for Participant A indicated that he preferred play items such as cars, trucks, blocks, and bubbles. Food items preferred by Participant A included pudding, juice, and cheetos. Results for Participant B revealed that he

preferred play items such as bubbles, dolls, and balls; preferred food items included juice and goldfish.

Procedures

The study was conducted at the LSU Language Preschool during 30-minute play periods twice weekly. Each subject received intervention with P&W cards and MPh pictured word cards during each session. Two student clinicians were trained to administer the PECS system using both the P&W and MPh cards. Each session was video recorded for the researcher to randomly view for a reliability check. Prior to the first intervention session, assessments were completed, toys and activities appropriate to each child were selected through observations during preschool play time, and the initial set of words selected and pictured.

Materials

The materials for this study included an initial 20 pictured vocabulary words specifically selected for each child.

Vocabulary Words

Ten vocabulary words were initially selected to be pictured for use by each subject during a 30-minute play session in preschool. New words were added as words were mastered. Noun words were selected to match toys that were responded to positively by the subjects, and the functional word "want" was included to enable the child to request objects or actions using an expanded utterance. Initially, 15 words were pictures with accompanied words (P&W) and 15 were superimposed picture with print cards (i.e., MPh).

Picture and Word Cards

Picture and Word cards were 3" X 3" color picture cards with accompanying words. Pictures depicted single objects (block, pretzel) or function words (want). The written word was printed in ½" letters at the top of the card.

MorphoPhonic Word Cards

MPh word cards were 3" X 3" color superimposed picture-on-word cards. Pictures cued the first sound of the word using a Phonic Face character and the meaning of the word shown by pictures embedded into the remaining letters of the word. The Phonic Face depicts production of the first sound represented by the letter (i.e., the letter "b" is drawn on the face as the bottom lip, indicating the sound is made by bouncing the bottom lip). The embedded pictures depict the meaning (i.e., for "baby," a baby's face is embedded in the letter "a" and the handle of a rattle is embedded into the long arm of the letter "y"). The written word was printed in ½" letters at the top of the card.

Targeted items

Targeted items included the toys and food used during the intervention to elicit communications. Toys included a ball, bubbles, play-doh, cars, crayons, markers, paper, merry-go-round, puppet, dog, cat, snakes, boy, girl, train, truck, baby, bottle, cow, pig, farm, chicken, and blocks. Food items included slices of orange, pretzels, goldfish, pudding, skittles, drink, cheetos, and marshmallows. Function words included "want."

Video Equipment

Video Equipment was a Canon ES8000V Hi8 Video Camera mounted to an adjustable video tripod. Video recordings were made of all intervention sessions.

Data Collection Cards

Index cards measuring 5.5 X 8.5 were used for data collection during each session. Each tally card had the headings: Spontaneous (S), Imitative (I), "I want" Exchange (I want), Guided Response (GR) or Nonverbal Exchange (NE) for each response. The clinicians put a mark under each appropriate stimulus: P&W cards or MPh cards.

PECS Training

Prior to the beginning of the first intervention phase, all participating clinicians were trained to use the PECS procedure. Training of PECS was taken directly from *The Picture Exchange Communication System Training Manual* (Frost & Bondy, 2003). For the P&W cards, if the child selected a picture and offered it to the adult, the clinician retrieved the picture from the child, showed and pointed to the picture, and provided the child with the desired object or action. For the MPh picture words, the clinician pointed to the Phonic Face of the card and made the sound, and then pointed to the picture part of the card and said the word. For example, for the word "truck," the clinician first pointed to the letter "t" in the character's mouth and said "tongue on teeth /t/," then to the pictured part of the word and said "truck." The desired object or action then was provided.

Intervention Sessions

Intervention was implemented for 30 minutes twice weekly for 6 weeks. Sessions took place in a quiet room in the preschool. The child was seated across from the clinician, either at a table or on the floor, with the picture cards for desired items within reach. The desired items were also within reach for the clinician.

The clinician held up a toy or other object and prompted a communication by asking "What do you want?"

A choice of 1-2 pictures, including one of the target items, was visible to the child and the examiner waited for the child to spontaneously select the picture and hand it to the clinician to make a request. For Participant A, the clinician marked a score sheet as "correct spontaneous response," "correct imitated response," or "exchange with no verbal response," or "I want exchange." For Participant B, when the child didn't respond, a second adult (facilitator) placed the card in the child's hand and guided him to exchange the card for the desired object and

"Guided Response" was checked. At least ten trials were administered during each session (1 for each of the 10 target vocabulary words; 5 P&W and 5 MPh).

For the P&W cards, when the child nonverbally handed a card to the clinician she named the picture and then pointed to and read the print on the card. If the child verbalized while handing the card to the clinician, she said "That's right" and provided the name and printed word, followed by the desired object. For the MPH cards, the clinician followed a similar procedure, but first called attention to the Phonic Face depicting the first sound of the word and then to the meaning using the pictures superimposed into the print to explain the meaning of the word.

Data Coding

Each response produced by the child was recorded on a preprinted 5.5x 8.5 card as either verbal or nonverbal, and elicited as imitative or spontaneous by using tick marks under each appropriate column. The MLU of any verbal utterance also was recorded. The clinicians also recorded the specific vocabulary used. Both subjects perseverated on favorite items. Thus, once a word was verbalized spontaneously, a new word was added using the picture format of that phase to avoid inflating scores. Data was monitored by the researcher daily to assess each participant's level of communication and the need to add new words.

Reliability

The video recordings were used to assure the validity of the implementation of the treatments and obtained the reliability of scoring of assessment and intervention measures. The graduate clinicians independently tallied communicative acts during intervention sessions. Reliability was not judged to be sufficient; therefore, all baseline assessments and 100% of each intervention session were independently rescored by the researcher from video recordings. Any discrepancies were resolved using the video recordings.

CHAPTER FOUR
RESULTS

The purpose of this study was to compare the use of MPh picture words versus pictures accompanied by words by two nonverbal preschoolers. The communications were elicited in the context of communicating for desired toys and food items following PECS procedures. Subject A had previously used PECS with pictures and words and was at Phase II (increasing the distance for the exchange) at the initiation of the study. Following 6 weeks of intervention, he achieved Phase IV (making a request for an item using the phrase "I want ___"). Subject B was new to PECS and began at Phase I (making an initial exchange) and progressed to Phase II. These results indicate that both children made progress in their ability to understand the use of the picture stimuli as a means of functional communication. To determine if one type of picture stimuli was more efficacious in eliciting communicative exchanges during the PECS phases, 15 minutes of each session were devoted to responses elicited using P&W cards and the alternate 15 minutes using MPh picture words. Order of presentation was randomly varied across days.

The first question of this study asked whether the MPh picture words would elicit more picture-exchange communication acts than pictures accompanied by words (both verbal and nonverbal), while the second question addressed whether an increase in verbal communications specifically would occur (both spontaneous and imitated).

Total Communication and Nonverbal Attempts

The two subjects were in different phases of PECS intervention, and their profile of communication attempts reflected these differences. Table 2 profiles the average gain scores across sessions for Subjects A and B for Total Communication Attempts and Nonverbal Communication Attempts. Examination of the means reveals that for Subject A, the average gains are consistently higher under the MPh condition for the total number of responses

(combined verbal and nonverbal attempts) and for the subset of nonverbal responses. In contrast, a negative relationship is shown for both MPh and P&W conditions for Subject B. That is, the total number of attempts at communication decreased across time, with a dramatic decrease in the nonverbal attempts. It should be noted that the nonverbal attempts occurred primarily when the child either selected a card spontaneously to hand to the clinician, or in Phase I especially, when the child was helped to pick up the card as a method of teaching picture exchange communication. Thus, the decrease in nonverbal communications is expected and actually a positive outcome. In that the *total attempts* included *nonverbal* communications, the decreasing number of total communication exchanges is not surprising.

Table 2

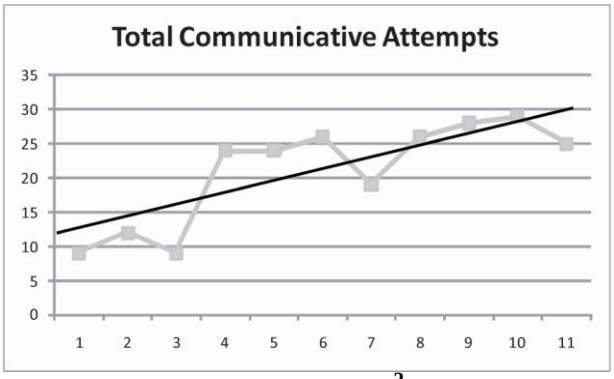
Average Gains in Total Communicative Attempts and Nonverbal Attempts across Sessions for the MorphoPhonic Picture Words verses Pictures with Words Conditions.

	Subject A		Subject B	
Condition	Total Attempts	Nonverbal	Total Attempts	Nonverbal
MPh	1.85	.52	-1.28	-2.13
PW	.76	.18	-1.33	-2.45

Total Communicative Attempts

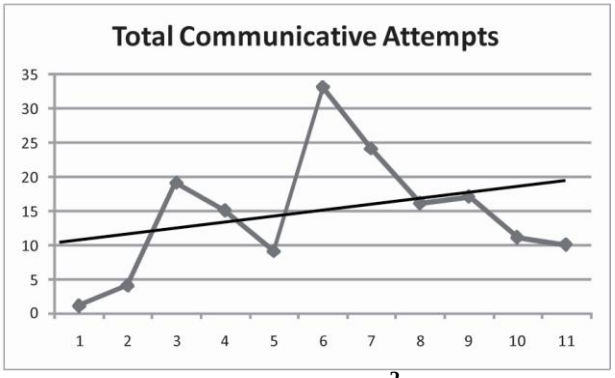
To determine the relationship of the picture type to *Total Communicative Attempts* across time, a linear regression analysis was conducted. The figure also shows the results of a linear regression analysis for the MPh total attempts for Participant A. Figure 2a shows the individual data points and the regression line for Participant A. The regression line has a slope of 1.85 indicating that, on average, the child increased his score by 1.85 per session. This resulted in an $r^2 = 0.66$, indicating that 66% of the variance in the total communicative attempts across time was explained by the MPh picture words. In contrast, Figure 2b exhibits that Participant A had an average gain per session of +0.76 for the P&W cards. The resulting r^2 of 0.08 indicated that for Participant A only 8% of the variance across time was predicted by the P&W cards.

Comparison of the data points for communicative attempts per session on Figures 2a and 2b reveal that a greater number of communicative attempts were produced for 9 of the sessions under the MPh condition, and that the final 8 sessions generated more than 15 communicative attempts. In contrast, 6 sessions generated more than 15 attempts for the P&W condition, with the total decreasing across the final 5 sessions.



slope = 1.85 r^2 = 0.66

Figure 2a. Total communicative attempts generated by Participant A using MorphoPhonic picture words.

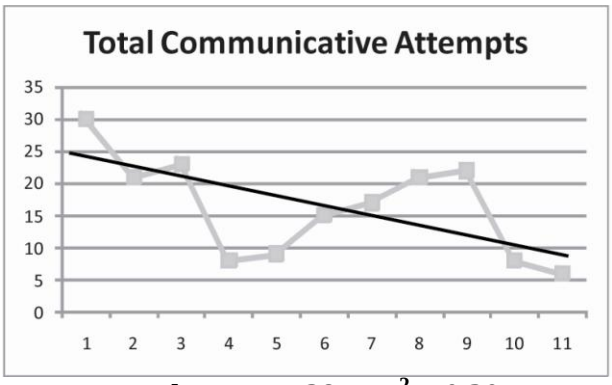


slope = 0.76 r^2 = 0.08

Figure 2b. Total communicative attempts generated by Participant A using Pictures with Words.

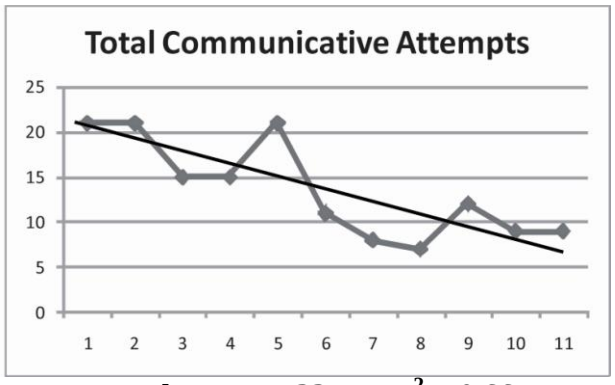
Figure 3a shows the results of a linear regression analysis for Participant B for the total attempts using MPh picture words. The regression line reveals the average gain per session of -1.28 resulted in an r^2=0.30, indicating that 30% of the variance in the total communicative attempts across time was explained by the MPh picture words. Figure 3b illustrates an average gain per session of -1.33 resulting in an r^2 of 0.66, indicated that for Participant B 66% of the variance across time was predicted by the P&W cards.

Comparison of the data points for communicative attempts per session on Figures 3a and3b reveal that Participant B exhibited an overall greater number of communicative attempts with the MPh condition throughout intervention. There were only 3 days when the P&W condition had marginally more communicative attempts. Furthermore, after the fourth session, the MPh condition trend showed a steady increase until the last 3 sessions while the P&W



slope = -1.28 r^2 = 0.30

Figure 3a. Total communicative attempts generated by Participant B using MorphoPhonic picture words.



slope = -1.33 r^2 = 0.66

Figure 3b. Total communicative attempts generated by Participant B using Pictures with Words.

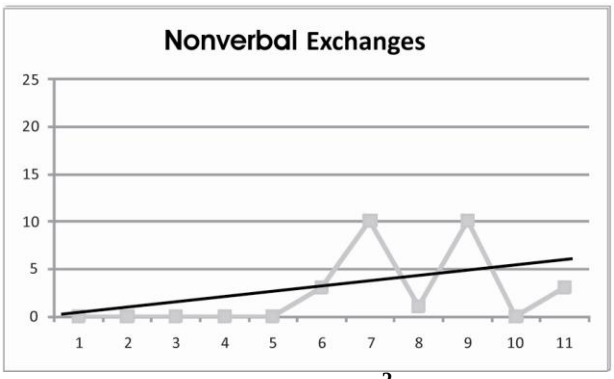
condition showed an essentially continuous decline following the first two days of intervention. In addition, Participant B generated more than 15 communicative attempts for 7 days during the intervention period compared to 3 days for the P&W condition.

Nonverbal Attempts

Figure 4a shows the results of a linear regression analysis for nonverbal communicative attempts using MPh picture words for Participant A. The regression line has a slope of 0.52 indicating that the child increased his score by .52 each session. This gain resulted in an r^2=0.19 indicating that 19% of the variance in the nonverbal communicative attempts across time was explained by the MPh picture words. Furthermore, Figure 4b shows that results for Participant A was an average gain of 0.18 resulting in an r^2=0.16, indicating that 16% of the variance in the nonverbal attempts across time were explained by the P&W cards.

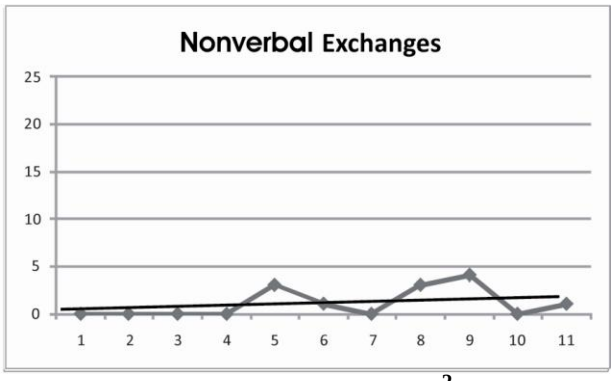
Nonverbal exchanges occurred when the subject selected a picture card and gave it to the clinician in exchange for a desired object or food item. In that Participant A began the study in Phase II of PECS, he was beginning to imitate words produced by the clinician and few of his exchanges were completely nonverbal. At points where new vocabulary was introduced or the

clinician attempted to facilitate his play with non-preferred items, such as sessions 6 through 9, more nonverbal exchanges were seen.



slope = 0.52 r^2 = 0.19

Figure 4a. Nonverbal communicative attempts generated by Participant A using MorphoPhonic picture words.



slope = 0.18 r^2 = 0.16

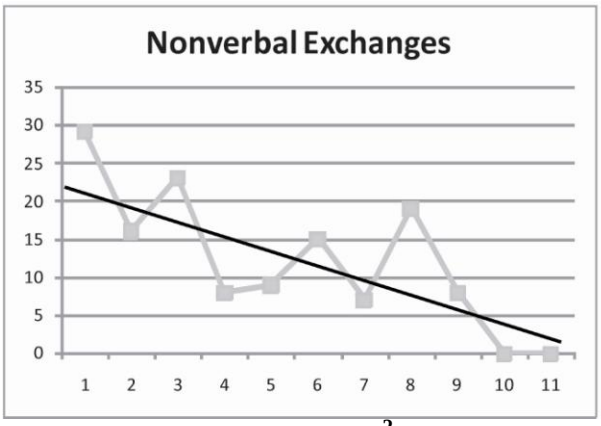
Figure 4b. Nonverbal communicative attempts generated by Participant A using Pictures with Words.

Participant B's results using a linear regression analysis for the MPh nonverbal attempts are illustrated in Figures 5a and b. The individual data points and regression line for Participant B indicates that the average slope of -2.13 resulted in an r^2=0.59, indicating that 59% of the variance in the nonverbal attempts across time were explained by the MPh picture words. Figure 5b illustrates an average gain of -2.45 resulting in an r^2 of 0.85, indicating that 85% of the variance in the nonverbal attempts across time was explained by the P&W cards.

Participant B was just beginning Phase I of PECS at the initiation of the study and so the majority of his responses were taught using hand-over-hand methods of guiding him to pick up a card and hand it to the clinician. Under both conditions, the expected decrease in nonverbal communications was seen as the child began to spontaneously use the picture cards and imitate verbally. Nonverbal communications were minimal by the 8th session for the P&W condition and two sessions later for the MPh condition.

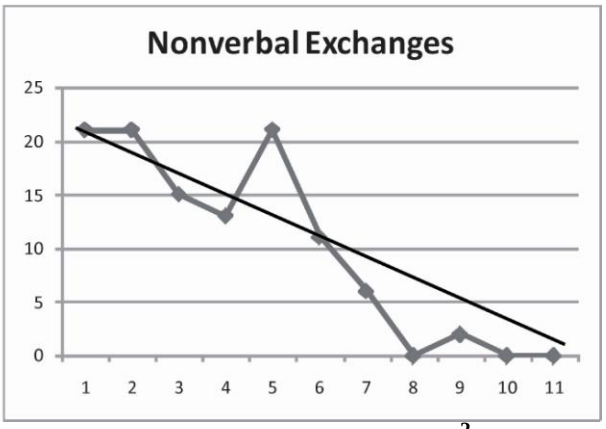
Spontaneous and Imitated Verbal Communications

The second question of this study asked whether an increase in verbal communications



slope = -2.13 r^2 = 0.59

Figure 5a. Nonverbal communicative attempts generated by Participant B using MorphoPhonic picture words.



slope = -2.45 r^2 = 0.85

Figure 5b. Nonverbal communicative attempts generated by Participant B using Pictures with Words.

specifically would occur, including those generated spontaneously and those produced through imitation. Table 3 profiles the average gain scores across sessions for Participants A and B for Spontaneous and Imitated Verbal Communication Attempts. Examination of the means reveals that for both subjects, the average gains are consistently higher under the MPh condition for spontaneous verbal responses and for the imitated responses. For Participant A, this performance was consistent with the total communicative attempts and the nonverbal communications, all of which were higher under the MPh condition. For Participant B, this performance reflected his change from a nonverbal child with essentially no communication

Table 3

Average Gains in Spontaneous and Imitative Verbal Communications across Sessions for the MorphoPhonic Picture Words verses Pictures with Words Conditions.

	Participant A		Participant B	
	Spontaneous	Imitative	Spontaneous	Imitative
Condition	Verbal	Verbal	Verbal	Verbal
MPh	1.16	.17	.91	.90
PW	.72	.12	.11	.41

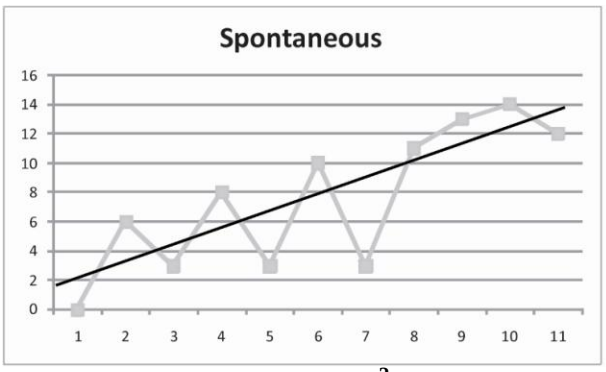
skills to one who used picture symbols to communicate and began to accompany the pictures with verbalizations. Thus, while his nonverbal communications decreased across time, both his spontaneous and imitated verbal communications increased, and increased to a greater degree using MPh picture words.

Spontaneous Verbal Attempts

Figure 6a shows the results of a linear regression analysis for spontaneous verbal communicative attempts using MPh picture words. The figure shows the individual data points and the regression line for Participant A. The regression line has a slope of 1.16 indicating that, on average, the child increased his score by 1.16 each session. This resulted in an $r^2 = 0.65$, indicating that 65% of the variance in the spontaneous verbal attempts across time was explained by the MPh picture words. In contrast, the average gain in the regression line for Figure 6b indicates that per session the slope increased 0.72 resulting in an r^2 of 0.14, indicated that only 14% of the variance across time was predicted by the P&W cards.

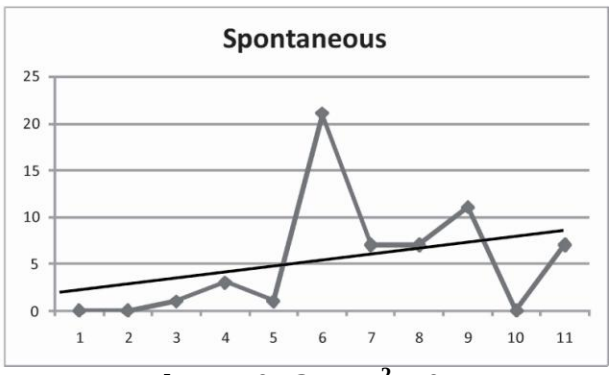
Comparison of the data points for communicative attempts per session on Figures 6a and 6b reveal that Participant A produced a greater number of spontaneous communications with the MPh condition for 9 sessions compared to 2 for the P&W condition. Furthermore, Participant A provided 10 or more spontaneous communications with the MPh condition on 5 days whereas the P&W cards elicited 10 or more spontaneous communications on 2 days. At the beginning of the intervention, Participant A attempted words with 1-2 syllables, often producing the initial consonant and/or vowels; by the end of the 6 weeks he attempted 2-3 word combinations such "I want cheetos," again with initial consonants and vowels.

A linear regression analysis was performed to assess the relationship of MPh spontaneous verbal attempts exhibited in Figure 7a for Participant B. The average gain in the slope per session of 0.91 resulted in an $r^2=0.45$, indicating that 45% of the variance in the spontaneous



slope = 1.16 r^2 = 0.65

Figure 6a. Spontaneous verbal communications Generated by Participant A using MorphoPhonic picture words.

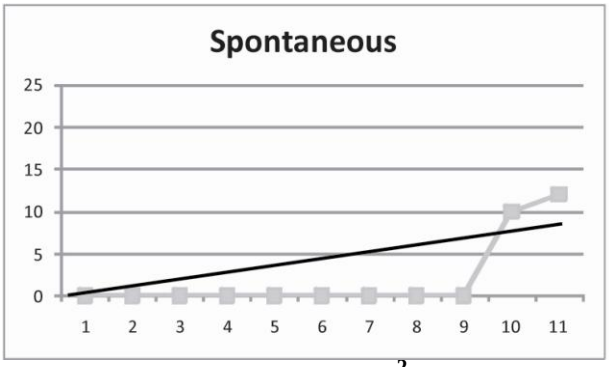


slope = 0.72 r^2 = 0.14

Figure 6b. Spontaneous verbal communications generated by Participant A using Pictures with Words.

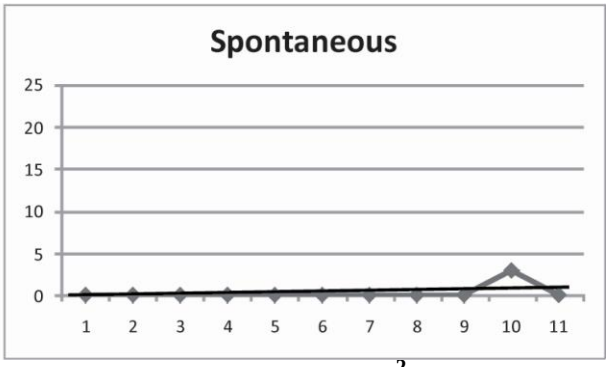
verbal attempts across time was explained by the MPh picture words. In contrast, Figure 7b illustrates an average gain per session of 0.11 resulting in an r^2=0.16, indicated that only 16% of the variance across time was predicted by the P&W cards.

Figure 7a shows that by the 10th session, Participant B who did not previously initiate communications verbally began to produce spontaneous verbal communications. The figure shows his rate was continuing to increase during the 11th session. Figure 7b shows he also produced 3 spontaneous verbalizations for the P&W condition (compared to 10 for the MPh picture words), but this was not continued during the 11th session.



slope = 0.91 r^2 = 0.45

Figure 7a. Spontaneous verbal communications generated by Participant B using MorphoPhonic words.



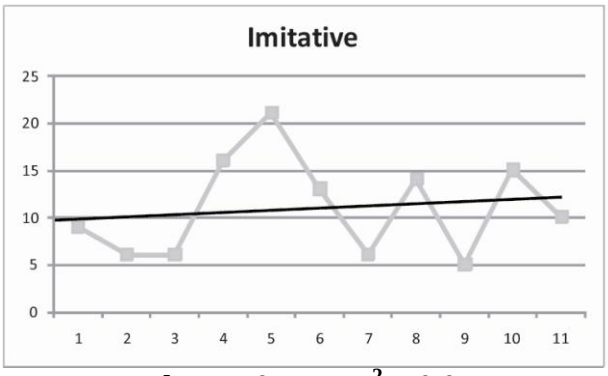
slope = 0.11 r^2 = 0.16

Figure 7b. Spontaneous verbal communications generated by Participant B using Pictures with Words.

Imitative Verbal Attempts

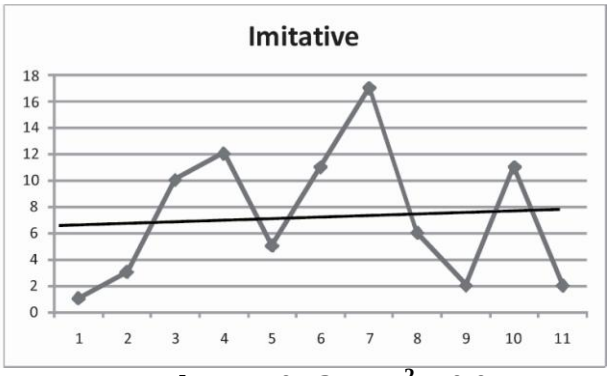
A linear regression analysis was conducted to determine the relationship of the picture type across time to *Imitative Verbal Attempts*. Figure 8a exhibits the results of a linear regression analysis for the MPh imitative verbal attempts. The regression line has a slope of 0.17 indicating that, on average, the child increased his score 0.17 per session. This increase resulted in an r^2 value of 0.01, which indicates that 1% of the variance in the imitative verbal attempts across time is explained by the MPh picture words. Similarly, as pictured in Figure 8b, the average gain of 0.12 resulting in an r^2=0.01, indicating that the variance of 1% in the imitative verbal attempts across time was explained by the P&W cards.

Comparison of the data points for communicative attempts per session on Figures 8a and 8b reveal that Participant A used a greater number of imitative verbalizations under the MPh condition. Specifically, there were only 2 days when Participant A used the P&W cards with more imitative verbalizations. Figure 7a shows Participant A produced 5 or more utterances imitatively for all 11 sessions, whereas the P&W condition provided 7 days when speech was produced imitatively.



slope = 0.17 r^2 = 0.01

Figure 8a. Imitative verbal communications generated by Participant A using MorphoPhonic picture words.



slope = 0.12 r^2 = 0.01

Figure 8b. Imitative verbal communications generated by Participant A using Pictures with Words.

Figure 9a shows the results of a linear regression analysis for MPh imitative verbal attempts. The regression line has an average gain per session of 0.90 resulted in an r^2 value of 0.35, indicating that 35% of the variance in the imitative verbal attempts across time were explained by the MPh picture words. In contrast, Figure 9b shows a slope for the P&W cards of 1.91 and average gain per session of 0.41 resulting in an r^2=0.06, indicated that for Participant B only 6% of the variance across time was predicted by the P&W cards.

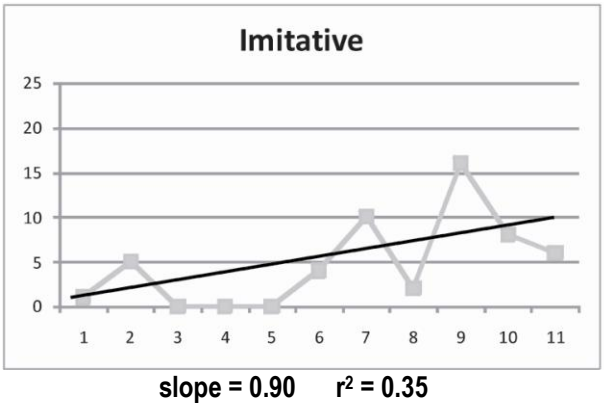


Figure 9a. Imitative verbal communications generated by Participant B using MorphoPhonic picture words.

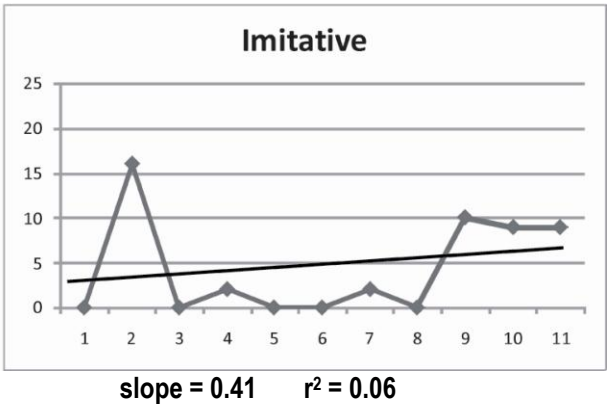


Figure 9b. Imitative verbal communications generated by Participant B using Pictures with Words.

Participant B produced a greater number of verbalizations imitatively with the MPh condition for 6 sessions, while imitations were greater for P&W condition for 3 sessions. Moreover, Participant B imitatively produced 10+ verbal communications in the MPh condition on 3 days versus only 2 days in the P&W condition. On the 6th session, imitative communication with the MPh condition began to increase, while similar increases using P&W did not occur until the 9th session.

Conclusion

The results of this study suggest that changes in communication can be observed in 6 weeks of intervention for nonverbal children using picture communication. The study also

reveals advantages for MPh picture words over pictures with words printed separately for both total communications and verbal communications.

CHAPTER FIVE
DISCUSSION

Autism is a disorder that has a pervasive effect on communication. The difficulties shown with both verbal and nonverbal communication persist into adulthood, with approximately 50% of children diagnosed with autism remaining functionally mute (Charlop & Haymes, 1994; Charlop-Christy, Carpenter, Le, LeBlanc, & Kellet, 2002). It is therefore important to determine whether interventions for this disorder are effective in increasing the communication skills. This study examined the verbal and nonverbal communication development of children with ASD, one who had used the Picture Exchange Communication System (PECS) during the previous spring, and one who was new to the system at the initiation of the study. The use of PECS was examined using two different types of picture symbols, one comprised of colored drawings with words printed above (Pictures and Print), and the other MPh picture words.

The results of this study revealed that both children increased their functional communication skills over the 6 weeks of this study. The subject who had been at Phase II (increasing the distance for the exchange) at the initiation of the study progressed two levels, to Phase IV (making a request for an item using the phrase "I want ___"). To accomplish this, he needed to initiate communication, communicate intentionally with another, recognize a specific picture symbol as a representation for a specific desired item, and use a combination of words and/or a series of picture symbols to communicate his internal state (wanting something) as well naming the item. Examination of his profile shows that the MPh picture words provided a scaffold for progressing through the phases to a greater extent than did the P&W Cards. During the first session, no spontaneous verbalizations occurred with either picture type; however, 10 imitated verbal requests were elicited using the MPh pictures versus no for the P&W cards.

Further, all of the requests elicited were verbal, indicating the child did not rely solely on the picture to communicate during any turn. The MPh picture words were effective in eliciting word attempts. During the second session, 6 spontaneous verbalizations were elicited in response to the MPh pictures previously introduced, indicating the child recognized their meaning and could approximate the speech production after just one 15-minute exposure. In addition, 6 imitations were elicited using the MPh pictures compared to 3 for P&W. From that session on, both picture types elicited imitative verbal requests, but the MPh typically elicited 5 to 15 more requests.

Similarly, following the first session, the MPh pictures consistently elicited spontaneous verbal productions, with 10 or more occurring for 5 sessions. In contrast, P&W did not elicit any spontaneous verbalizations until one occurred during the 3rd session, and five sessions elicited one or none. Ten or more spontaneous verbalizations were elicited for only 2 sessions. The consistency at which a greater number of both imitative and spontaneous verbal productions occurred for the MPh condition and the fact that they occurred earlier in the series of treatment sessions indicates that the MPh picture words were more effective in eliciting verbalizations from a child in phases II through IV of PECS training than Pictures with Words.

At points where this subject transitioned to new phases of PECS, nonverbal exchanges as well as verbal requests were seen for both picture conditions. Once again, a greater number were typically elicited under the MPh condition. For both picture types, the number of nonverbal requests decreased rapidly while verbal requests increased. The use of the verbal "I want ___" occurred during session 8 for both picture types, although a greater number occurred for the MPh condition (4 versus 6). Following the initial use, both conditions elicited the phrase at the same rate.

The second subject was new to PECS and began at Phase I (making an initial exchange) and progressed to proficiency at Phase II. Examination of his profile showed that MPh picture

words typically led P&W in eliciting requests. During the first session, the clinician was able to elicit a greater number of hand-over-hand requests using the MPh pictures. Also during that session, the child independently used a MPh picture to communicate 5 times, compared to none for the Pictures with Words. The need for hand-over-hand decreased to a minimal level during the 2nd session for MPh pictures and was essentially not needed after that time, while this decrease did not occur for the P&W condition until the 3rd session. Independent exchanges replaced hand-over-hand by the 2nd session for MPh words where 15 occurred compared to 4 for the P&W condition. A greater number of independent nonverbal exchanges continued to occur for the MPh picture words for all but 3 sessions.

Imitated verbal responses occurred for both picture types by the 2nd session, with an initial advantage for P&W cards for one session. Their occurrence dropped to a minimal level until the 6th session, where MPh picture words led in frequency of imitated requests for several sessions. Spontaneous verbal requests did not occur for either condition until session ten, at which point MPh picture words elicited 10-12 requests for the next two sessions. Comparable gains were not evident for the P&W condition, in that only 3 spontaneous words were produced once in only one session, thus suggesting that the MPh picture words were providing cues to speech production and expressive words that the P&W symbols were not.

The results of this study were consistent with Kaufman, Norris, and Hoffman (2007), in that both children in this study became verbal within a few sessions, with strong evidence that the MPh condition actually prompted the change. The child in the Kaufman et al. study had average receptive abilities, while the children in this study had limited ability to understand or use language. And yet, multiple spontaneous and imitated responses were seen for the more advanced child from the first day of intervention. The child just beginning PECS progressed

from completely nonverbal to spontaneously verbal by session 10, or 8 sessions after imitation began, with nearly all verbal requests occurring under the MPh condition.

This study is the first that explored the effects of using different picture types with PECS intervention in children with Autism Spectrum Disorders (ASD). This study supports that both Pictures with Words and MPh picture words were effective picture systems for PECS, but that the number, spontaneous occurrence, and production of verbal requests occur earlier and more frequently when using MPh picture words. It is unclear from this study what elements of the MPh picture words created this advantage. While the goal was not to teach print or alphabet recognition, these features of the MPh pictures, especially the initial Phonic Face, may have provided cues to articulation that prompted verbal imitations and productions. Further, the pictures superimposed into the print may have simultaneously provided cues to the meaning and the form of words that enabled the children to deduce the concept of a word. This finding is consistent with research of written word recognition using superimposed (Tabe & Jackson, 1989) and enhanced words (Blischak & McDaniel, 1995) which share the overlap of print and picture aspects of MPh picture words.

Experimental Confounds and Limitations of the Study

The proposed study has several limitations. Only two children participated for a very short time frame. Not all children diagnosed with autism have similar abilities and deficits, and only two profiles were examined here, both in early stages of PECS and verbal language abilities. The results could differ based on factors of each participant's level of maturation, attendance, language abilities, and degree of autistic characteristics. The long-term advantage of MPh picture words needs to be explored with a larger population. It is not known whether words will be maintained long-term or used across multiple contexts, nor how long training must continue to effect these longitudinal changes. Given that the participants are preschool age, it is

possible that other developmental delays have not yet been identified that could affect outcomes. Furthermore, the projected study is not a blinded study, so clinician bias must be taken into account when analyzing data obtained.

While the MPh picture words have been shown to effectively teach alphabet, letter-sound and word recognition abilities, they were not specifically examined in this study. Future research should explore the effects of these words on written language development.

Another confounding issue surrounding the proposed study is that probes were not taken at timed intervals. While the use of video recordings were used to minimize this problem, continuous recording places more responsibility on the clinician and the researcher to accurately record speech productions. Lastly, a limitation future studies may assess is that the method of MPh instruction used to introduce and teach the words has not been studied for children with autism.

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VITA

Ashley Bourque was born and reared in New Iberia, Louisiana. After graduating from New Iberia Senior High School in 1997, she moved to the big city of Baton Rouge to study at Louisiana State University and Agricultural and Mechanical College. She was awarded a Bachelor of Arts degree in English and a Bachelor of Arts degree in communication sciences and disorders in December 2004.

After working with a child diagnosed with autism at Plymouth Elementary School in Plymouth, New Hampshire, Mrs. Bourque decided to continue her educational journey and enroll in the master's program in communication sciences and disorders at LSU. Once enrolled in the program, she decided to complete a thesis project in partial fulfillment of the requirements for her Master of Arts degree, to be awarded May 2008. Upon graduation, Mrs. Bourque intends to fulfill her educational pursuits by continuing at LSU to receive a doctoral degree in communication sciences and disorders and continue research projects under the guidance of Jan Norris, Ph.D.