Initiations and Responses: A Comparison of Two AAC Interventions

BY

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ABSTRACT

The purpose of this study was to compare the effects of a speech generating device with a dynamic display and a picture board on the initiations and responses of children with autism spectrum disorders. An alternating treatment design was used to evaluate the initiations and responses of two preschoolers with autism spectrum disorders in the two treatment conditions. Each child participated in five sessions, an introductory baseline session with no augmentative communication devices and two sessions with a picture board and two sessions with a speech generating device. Findings in this study were mixed. Participant A had used the picture board a total of four times and the SGD a total of three times. Participant B used the picture board a total of twenty times and the SGD a total of forty times. Each participant responded more frequently than he initiated. Even though the results of this study were mixed, each child was able to learn to use both systems within a limited time frame.

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Introduction

Autism

Autism is defined as a developmental disability affecting social interaction, communication, and adaptive behaviors (American Psychiatric Association, 2000). Autism is classified as one of five neurologically based disorders under the Pervasive Developmental Disorder (PDD) umbrella including: (a) autistic disorder, (b) Asperger disorder, (c) pervasive developmental disorder-not otherwise specified (PDD-NOS), (d) Rett syndrome, and (e) childhood disintegrative disorder (CDD) (Centers for Disease Control, 2007). Onset occurs prior to 36 months of age and according to a recently released survey by the Centers for Disease Control and Prevention (2007), approximately 1 in 150 individuals have a form of autism spectrum disorder (ASD). This means a total of 560,000 people in the United States have the disorder. ASD is cited as the fastest growing developmental disability (Centers for Disease Control, 2007).

There are many theories as to the cause of autism. None of them provide a definitive answer at this time. ASDs have several different phenotypes and therefore, many potential underlying causes. Evidence has found that autism is heritable, but it is likely that many genes are susceptible. Candidate autism gene studies have not been able to be replicated. Therefore, there is not a known gene that is affected in individuals with ASD (Newschaffer et al., 2007).

It is thought that these genes may interact in certain ways with environmental factors. Antibiotic treatments as well as vaccinations, specifically the measles, mumps

and rubella vaccine, have been thought to be linked to autism. However, there is not sufficient evidence to support this association. (Newschaffer et al., 2007)

Infection and immune dysfunction, neurotransmitters, peptides, and growth factors, as well as specific environmental factors have also been the target of research lately. But as with all of the believed causes, findings are still uncertain (Newschaffer et al., 2007).

Though the etiology is unknown, a set of diagnostic criteria has been set forth by the American Psychiatric Association in the DSM-IV-TR (American Psychiatric Association, 2000) for diagnosing an autism spectrum disorder. These criteria are impairments in the areas of (a) social interaction, (b) communication, and (c) a restricted repertoire of activities and interests. Because communication is a core deficit in ASD, there is a strong need for communication intervention services.

Communication and Autism

Though communication is a core deficit in autism spectrum disorders, there is a range of communication abilities in children with autism spectrum disorders. It is estimated that from 28 to 61% of individuals with autism spectrum disorders are nonverbal (National Research Council, 2001). This wide range is due to discrepancies between studies as to the definition of "spoken language". Therefore, the National Research Council's (2001) best estimate is that one third to one half of children and adults with autism do not have functional speech. ASD can be thought of as primarily a social communication disability. The disorder also makes it difficult for the communication partner to modify his or her interactional style so that successful communication can take place. The partner may not understand what the individual with

autism is trying to communicate or how to respond to them. This deficit is likely to create difficulty for both the individual with ASD as well as his or her communication partner (American Speech and Hearing Association [ASHA], 2006).

Expressive and Receptive Language. Children with autism have difficulty with all of the language domains including form, content, and use. This is evidenced by their lack of speech, or delay in functional speech, and their echolalic tendencies (Light, 1999). Boucher (2003) found that in some cases, receptive language and comprehension were more impaired than expression. Some children with autism tend to memorize language and repeat it from rote memory without comprehending its semantic meaning (Boucher, 2003).

Children with autism can demonstrate a lack of expressive language, stereotyped or repetitive language, as well as poor social play. Complex language structures allow individuals to talk about events, give appropriate background information, express feeling and emotion, and to repair communication breakdowns. Individuals with autism lack these language skills making social interaction with others difficult (ASHA, 2006)

Social interaction. Deficits in social interaction are a primary characteristic of ASD. People with autism experience impairments in reciprocal social interactions including initiating and responding to bids for interaction (ASHA, 2006). Children with autism have difficulty shaping their language to reflect their listening partner's needs (ASHA, 2006). They may also have developed a routine way of interacting with people, maintaining a narrow range of topics and may have difficulty reading the perspective of their communication partners (Quill, 2000).

Children with autism also have difficulty establishing joint attention, or focusing on the same thing at the same time with a social partner. This inhibits their ability to initiate or respond in interactions. This lack of joint focus also makes it difficult for children with autism to learn when language is paired with what it represents (McDuffie, 2005). Quill (2000) states that reciprocal communication, pretend play, and the ability to relate to others' emotions are also affected by a lack of joint attention.

It is thought that children with autism have difficulty reading and understanding others' expressions and emotions (Dawson, 1998). This may be due to the complexity and unpredictability that these emotions and expressions present. Due to these factors, children with autism are not naturally drawn to the types of social stimuli that provide the basis for social development (Dawson, 1998). If children are not naturally drawn to social stimuli, they may miss out on these opportunities to initiate and respond to language.

Communicative forms and functions. Without a functional means of communication, children with autism who are nonverbal may use more unconventional means to express themselves. Mirenda (2005) states that challenging behavior develops because everyone communicates in the most easily accessible and effective manner available to them. Individuals with autism who are nonverbal use behavior because it is the easiest and most effective way to have their needs met. Mirenda (2005) examined students with unconventional behaviors who were given some form of AAC (visual schedules, visual contingency plans, or a one-step device). When AAC was used, their challenging behaviors diminished. AAC provided them an effective and accessible means to communicate their thoughts and feelings (Mirenda, 2005). Other research

suggests that if an alternative communication system can be identified and utilized, it may lessen challenging behavior and help to generalize information across settings and partners, as well as increase retention of skills (Wetherby, 2000).

Children with autism tend to regulate themselves through requests and protests. Self regulation is the individual's ability to regulate their own emotional arousal (e.g. rocking) in order to meet personal need. Most of their initiations and responses serve the communicative function of requesting or protesting. (Wetherby & Prizant, 2000)

The conversational partner's response to initiations can serve to facilitate comprehension of words. McDuffie, Yoder, and Stone (2005) found a predictive relationship between comprehension and commenting in children. These researchers established joint attention before attempting to teach participants with ASDs vocabulary items to study the impact of joint attention on comprehension. A play session was conducted using one item at a time. Intentional communication was then recorded as any gesture or vocalization that established shared attention on the object and the examiner. They concluded that by responding through joint attention to a child's initiation with an object, partners may help the children to increase their word learning.

The lack of language skills in individuals with autism causes initiating and responding during social interaction to be very difficult. AAC provides these individuals with a means to interact and have their needs met.

Augmentative and Alternative Communication (AAC)

AAC is defined by (American Speech Language Hearing Association, 2002) as:

> … a set of procedures and processes by which an individual's communication skills (i.e., production as well as comprehension) can be

> maximized for functional and effective communication. It involves supplementing or replacing natural speech and/or writing with aided (e.g., picture communication symbols, line drawings, Blissymbols, and tangible objects) and/or unaided symbols (e.g., manual signs, gestures, and finger spelling) (p. 2)

AAC should not be viewed as a last resort, but instead as the first line of intervention that provides a firm foundation for the development of spoken language comprehension and production (Romski, Sevcik, & Adamson, 2004). The use of AAC techniques may facilitate speech and language development and production (Mirenda, 2003). The American Speech–Language-Hearing Association's Roles and Responsibilities for working with individuals using AAC (2004), states that it is the role of the speech-language pathologist to provide a form of AAC to anyone that displays a discrepancy between communication needs and abilities. A multimodal approach should be taken in order to ensure that effective communication is achieved. (ASHA, 2004)

For individuals with developmental disabilities, AAC may also provide a more immediate and consistent model to learn from. In a meta-analysis of the impact of AAC on speech production, Millar, Light, and Schlosser (2006) found that in 89% of the cases included in the analysis demonstrated increased speech production during or following AAC treatment. Since children with autism tend to rely more on visual cues, or representation of what is being communicated in either object or picture form, using visual representations may help them to learn the information (Wetherby & Prizant, 2000).

A study conducted by Von Tetzchner (2005), demonstrated that given the appropriate opportunities and appropriate instruction from teachers and peers, many individuals who are nonverbal can learn aided techniques for functional communication. This study also suggested that graphic symbols may be easier to learn because they make fewer demands on memory than do manual signs. Therefore, it is important to keep in mind that aided approaches may require less effort on the learner's part.

Research has shown that in children with spoken language, voice output may contribute to learning to comprehend and produce graphic symbols. Utilizing voice output to increase comprehension of individuals with ASD who are nonverbal maybe accomplished through AAC (Von Tetzchner, 2005). The children either receive spoken language in the form of output from the device or from the communication partner in order to build their own knowledge of the language. Parsons and LaSorte (1993) found that when intervention with speech output was provided, vocalizations of children with autism increased. When no speech output was present, there was not a change in spontaneous utterances. There is also evidence that the use pictures or picture boards without speech output is an effective form of communication for individuals with autism who are nonverbal (Wendt, 2006).

Picture communication systems. A variety of picture communication strategies have been used with children with autism (Frost and Bondy, 2002; Johnson, 1994; Silverman, 1995). Symbols can include graphic, auditory, gestural, or tactile expressions. Aided systems are those that are external to the individual. These frequently include a picture. Pictures can be line drawings through photographs. Systems of line drawings

have been developed that have varying levels of iconicity. Included in these are Picture Communication Symbols (PCS) (Johnson, 1994), and Blissymbolics (Silverman, 1995).

The Picture Exchange Communication System (PECS) (Frost and Bondy, 2002) is one method of aided AAC that is well known. This method uses graphic symbols for communication. The initial goal of this system is to teach individuals to initiate and request (Schwartz, 1998). The PECS user makes a request by handing the symbol for the desired item to the communication partner. Eventually, the individual is able to put the pictures into a sentence in order to make a request (Schwartz, 1998).

Koul and Schlosser (2004) examined the effects of iconicity on acquisition of symbols. Symbols were coded as either highly translucent, if they resembled their referent, or low translucent, if they did not resemble their referent. It was found that participants in the study were better able to learn the symbols with high translucency. It was also found that auditory feedback on the SGD also helped to increase symbol learning (Koul, 2004).

Peterson, Bondy, Vincent, and Finnegan (1995) conducted a study with two students with autism who were nonverbal. The students participated in an object retrieval task under three conditions: (a) spoken cue, (b) spoken plus gesture/pictorial cue, and (c) gesture/pictorial cues only. The students performed better when a pictorial cue was provided either with or without spoken input. The authors suggested that spoken cues may be insufficient for some children with autism. Spoken output augmented with picture cues may help facilitate comprehension and functional use.

Picture communication systems have been shown to benefit individuals who are nonverbal. However, research suggests that adding speech output to visual cues enhances

comprehension (Schepis 1998; Schlosser et al., 1995; Sevcik, Romski and Adamson, 2004; Von Tetzchner, 2004).

Speech generating device (SGD). Another choice of aided communication systems for children with autism who are nonverbal is a speech generating device. A speech generating device has a visual display that includes pictures that represent different single words, phrases, or sentences. The device uses either synthesized or recorded speech to provide a voice for the child (Mirenda, 2003). Access methods to these devices include direct selection of icons, and scanning. In direct selection, the user touches the icon they would like to speak. During scanning, the SGD speaks all of the icons on the board until the user stops the device to make a selection. SGDs are set up with either a static (single page) or a dynamic display (layers of pages that represent various topics) of the symbols (Beukelman, 2005).

SGDs have been found to increase initiation and responses in children who are nonverbal. Sevcik, Romski, and Adamson (2004) found that the quantity of initiation and response attempts increased when a child with autism was provided with an SGD. Preschool children with developmental delays who had little to no functional speech were taught to use an SGD at home as well as in clinical settings. There were significant gains in communicative attempts in the home setting following the introduction of the SGD (Sevcik, Romski, and Adamson, 2004). Sigafoos et. al (2004) found that it was beneficial for children who were nonverbal to use an SGD to repair communication breakdowns when they were initiating the request of an item. Two students on the autism spectrum were taught to repair communication breakdowns by using a voice-output communication aid, or an SGD. It proved beneficial to repairing the breakdown as well

and helping the individual to meet their needs (Sigafoos et al., 2004). Schepis (1998) found that children with autism were able to make requests, answer yes and no questions, make statements, and comment using a device when teachers were trained and provided AAC intervention to students during natural classroom activities.

There is some evidence that gives an advantage of utilizing voice output over non-speech options. Schlosser et al. (1995) compared SGDs to non-speech generating devices. Three adults with severe to profound mental retardation were taught to point to pictures. The first condition was with the auditory stimuli provided before and after the picture was presented. The second condition involved no auditory stimuli. It was found that the auditory stimuli made learning the pictures more efficient and with fewer errors. This indicated that auditory stimulation is effective for supporting graphic symbol learning. However, the non-SGD was also effective suggesting that any type of aided communication can be beneficial.

SGDs can provide an easier means of communicating with unfamiliar people in everyday environments. As a result of this, SGDs can facilitate natural interpersonal interactions and socializations (Schepis, 1998). SGDs provide a means for others, both familiar and unfamiliar, to interact with the user. There is no special knowledge or skills needed in order to understand SGD communication. An SGD is also more useful in gaining attention of a communication partner over other alternative communication forms (Schepis, 1998).

Intervention Strategies for AAC

Several aided input approaches have been reported in the literature. These approaches focus on increasing comprehension and vocabulary expansion. An approach

for individuals with ASD is Aided Language Stimulation (Goossens', Crain and Elder, 1992). Picture boards are placed around the classroom, or other natural environment, where desirable items have been placed out of reach. This encourages the child to request these items using the picture board (Cafiero, 2007).

The System for Augmenting Language (SAL) is a form of aided input that encourages but does not force the child to utilize AAC (Sevicik, Romski & Adamson, 2004). The use of SAL with an SGD called the WOLF, in a naturalistic environment was found to increase communication in four children with developmental delays. Schepis, Reid, Behrmann, and Sutton (1998) found that the efficacy of an SGD used in combination with naturalistic teaching procedures increased the communicative behaviors of four children with autism. Teachers were trained to use natural teaching methods during their daily routines in the classroom. Using SGDs, all of the children demonstrated an increased ability to comment, request, make statements, and answer yes-no questions at the end of the study.

Drager, Postal, Carrolus, Castellano, Gagliano, and Glynn (2006) described an approach similar to these approaches called Aided Language Modeling (ALM). Aided Language Modeling involves pointing to an object and a symbol associated with the object and labeling the object vocally at the same time. Drager et al.(2006) researched the effectiveness of Aided Language Modeling with two preschoolers with autism who had little functional speech. During engagement in interactive play sessions, ALM was used to model AAC symbols. Both participants were able to increase and maintain their symbol comprehension and production. Therefore, it was suggested that AAC symbols be used to facilitate comprehension of language in young children with autism.

Intervention Context. All of these approaches or strategies augment the message and were implemented in natural contexts. The natural context provides the opportunity to take advantage of naturally occurring opportunities to develop communication skills. The use of natural context is supported in the ASHA Guidelines for Treatment of Autism Spectrum Disorders Across the Life Span (2006) which states that:

"…natural learning environments invite higher rates of initiation and generalization, progress in these contexts is more likely to result in school success and translate into a better quality of life and increased social acceptance" (p. 16).

In a study conducted by Schepis, Reid, Behrmann, and Sutton (1998), teachers were trained to use naturalistic methods to aid children with autism using SGDs. Naturally occurring opportunities, snack and play, were used to teach children communicative functions using an SGD. The naturalistic teaching with these four children yielded positive results. The children with autism were able to consistently use their SGDs to request, respond yes or no to questioning, make statements, and to socialize without prompts by the end of the study.

All types of AAC, manual signs, graphic symbols, and SGDs, have potential to help individuals with autism who are nonverbal to communicate more effectively. Deciding which type of AAC system is best and how to teach its use for an individual is complex and depends on the current goals of the individual, their existing skills, family preferences, and the settings in which their AAC will be utilized (Mirenda, 2005). Consequently, all AAC options should be examined and research should continue to determine the variables affecting AAC use with children with autism. One such variable of interest is speech output.

Purpose of the Study

The purpose of this research was to compare the effects of SGDs and picture communication systems on the initiations and responses of children with autism spectrum disorders.

Chapter II

Methods

This research compared the initiation and response patterns of children with autism when using a picture board and a speech generating device. An alternating treatment design was used in this study.

Participants

Selection criteria and recruitment. Recruitment of participants was completed through contacting area preschools (Appendix A). Packets with fliers (Appendix B), an invitation to parents (Appendix C), and introduction to the preschool's administration (Appendix D) were given to representatives from the preschools. Also posted were an announcement in the local newspaper (Appendix E), and an announcement through online listservs (Appendix F). Interested individuals contacted the researchers for an information packet and a letter of consent (Appendix G). The parent of the child was then asked to fill out a The MacArthur-Bates Communicative Development Inventory: Words and Gestures (Fenson, L.et al., 1993) in order to determine that their child had an expressive vocabulary of 20 or fewer words. Parental consent (Appendix G) was obtained in order for the child to participate and be digitally recorded for educational and research purposes. A preference form was also included to identify appropriate play themes (Appendix H).

Participant Description. There were two participants in this study. Participant A was a 4 year old boy who received a diagnosis of autism at the age of three. He was Caucasian. He lived at home with his parents and older brother. He attended preschool four days a week for two hours each day. He received two thirty minute speech therapy

sessions and one thirty minute occupational therapy session a week. He also received private speech therapy services once a week for forty-five minutes. According the MacArthur-Bates Communicative Development Inventory: Words and Gestures (Fensen et al., 1993) completed by his parent, he spoke approximately 12 words at the beginning of the study, he understood 209 words, used 11 early gestures, 32 later gestures for a total of 43 gestures. See Table 1 for a list of the words he used. During the baseline introductory session he communicated a total of 42 times and used communication to protest/reject 28.5%, request 40.5%, confirm/deny 16.6%, social interaction 4.8%, gain attention 2.4%, direct attention, 4.8%, and to ask a question 2.4% of the time. He communicated mainly through vocalizations, body movement, action on object and facial expression. He had some experience communicating with the Picture Exchange Communication System (PECS) which he had begun using 10 months prior to the study and was using approximately seventy-five icons at home and one-hundred and fifty at school. His mother reported that his PECS were used mostly to request food, hugs, kisses, or tickles.

Table 1

Participant Vocabulary

Participant A	Participant B
baa baa	hello
grr	bye or byebye
moo	
ouch	
uh oh	
vroom	
ball	
daddy	
bye	
no	
peekaboo	
shhhh	
hug	
love	
open	
mine	

Participant B was a 5 year, 2 month old boy. His family was from India and spoke English in the home. Participant B was born in the United States. According to the MacArthur- Bates Communicative Development Inventory: Words and Gestures (Fensen et. al., 1993), his parent reported that he spoke two words, understood 84 words, used 14 early gestures and 33 later gestures for a total of 47 gestures. See Table 1. During the baseline introductory session he communicated a total of 33 times and used communication to request 57.6%, confirm/deny 18.2%, comment label 12.1%, direct attention 9.1% and protest/ reject 3%. Participant B primarily communicated by leading or directing others and other body movement as well as a few vocalizations. He communicated to get his requests met. He attended half-day special education preschool.. He received occupational and speech therapy for one hour per week each. He was using a low-tech communication device, the Blue Bear, infrequently at school. He only used the device at school during speech therapy and had been using it for approximately a month when the study began. He was included in the study due to the fact that his device was introduced recently and being used in a single context.

Setting and Context

The study was conducted at the Schiefelbusch Speech-Language-Hearing Clinic on the University of Kansas campus in a therapy room. Each session was play-based with a different theme. See Appendix I for a sample session plan. The intervention sessions were loosely associated with the Language Acquisition Preschool curriculum (Bunce, 1995). This curriculum focuses on the development of language skills through developmentally appropriate materials and opportunities. Targeted vocabulary is

embedded into meaningful social contexts. The curriculum is focused around themes, much like the sessions involved in this study.

A preference assessment (Appendix H) was sent with the information packet to families for them to rank their child's preferred play-based themes. The themes ranked the highest by both families were used during the both of the participants' sessions. Themes included transportation, actions, opposites, house, and construction. See Table 2 for vocabulary used in each session. A pop-up book was chosen for each theme and then theme related toys were placed around the room to encourage the vocabulary use. Intervention took place on the floor.

Table 2

Session themes and vocabulary

Session 1: Transportation	Session 2: Actions	Session 3: Home	Session 4: Opposites	Session 5: Building
More	More	More	More	More
Turn the page	Turn the page	Turn the page	Turn the page	Turn the page
My turn	My turn	My turn	My turn	My turn
Your turn	Your turn	Your turn	Your turn	Your turn
All done	All done	All done	All done	All done
Stop	Stop	Stop	Stop	Stop
Go	Go	Go	Go	Go
I want	I want	I want	I want	I want
Rocket	jumping	cook	Big	toolbox
Boat	spinning	music	push	wrench
Airplane	pinwheel	bath	open	hammer
Motorcycle	swinging	bed	in	saw
Hot air balloon	swimming	car	tall	Clock
car	flying	ball	fast	screwdriver
Sticker please	marching	house	asleep	present

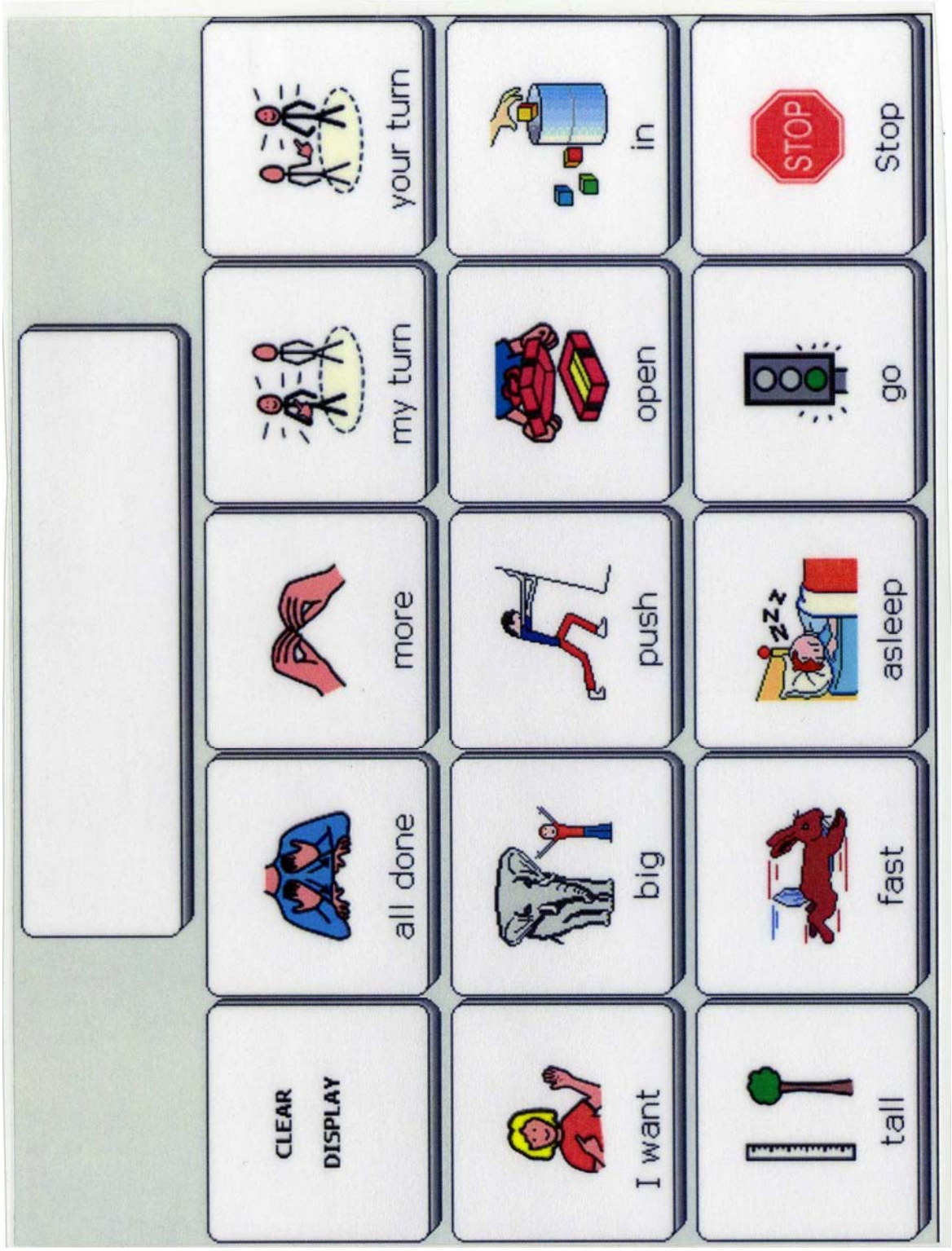
Communication Systems. A picture communication board and a page on the *Springboard* device were created for each of the play based sessions. See Figures 1 and 2.

Figure 1

The *Springboard*

Figure 2

Picture Communication Board



The Springboard is a color touch screen computer with voice output and a text display panel for the users to see what is being spoken. The screen can be arranged into 4, 8, 15, or 32 buttons to accommodate different levels of expertise (Prentke Romich Company, n.d.). The Springboard can be accessed through direct touch or scanning. The Springboard is a device utilizing dynamic display technology in which a selection on a display results in a new array of graphic symbols. Dynamic display offers the advantage of having fewer symbols on a page at one time while still allowing access to a large number of vocabulary items (Drager, Light et al., 2004). The vocabulary words for the *Springboard* were recorded by one of the investigators prior to each session.

The *Springboard* page was created and printed using The Prentke Romich Company Application and Support Software so that the Springboard and communication boards were identical. Both the device and picture communication boards measured 6 x 8 inches and displayed fifteen icons representing the 14 targeted vocabulary words and a button to clear the display.

Vocabulary. Each system contained eight symbols that remained the same from session to session. These were: more, turn the page, my turn, your turn, all done, stop, go, and I want. Seven other vocabulary items changed from session to session to reflect the theme of the session. These included single words, and short phrases. See Table 2. A keyguard was placed on the SGD in order to help the participants hit the key accurately without accidentally activating other keys.

Procedure

An alternating treatment design was used to conduct this investigation. Alternating treatment design is defined as applying two or more interventions to the same set of behaviors (Barlow 1979).

Baseline. An introductory baseline session was conducted to introduce the participants to the setting and investigators and to observe their communication. The session theme was transportation and lasted approximately thirty five minutes. The participants were not given either augmentative alternative system for this session. The session was digitally recorded for later coding and analysis.

Intervention Sessions. The intervention sessions each had a play theme. The session was child directed in that the investigators allowed the participants to choose from the provided activities. Each session included motor activities, art projects, and play using theme based toys that corresponded with the book's theme for that day. The child was provided either a picture communication board or the SGD to use during the duration of each session.

The devices were alternated, one session with a speech generating device and the next a picture communication board. Each child received the opportunity to use each mode of communication twice with random assignment as to the mode which was used first. Participant A used the SGD, and Participant B used the picture communication board first.

The picture communication board and the SGD were modeled by the investigator during the play activities. Participants each received four treatment sessions. Participant A's sessions tended to average forty minutes, while Participant B's were approximately

thirty minutes in length. Each vocabulary word or phrase was modeled ten times per session. When each vocabulary item had been modeled ten times, the session was concluded. A sample of the vocabulary checklist can be found in Appendix J. There were two researchers present during each session. One researcher conducted the session while the other monitored vocabulary input. Each child's parent was present in the room during each of the sessions.

Observation and Measurement

All sessions were digitally recorded with a mounted Mace camera and a Pioneer 640H DVD Recorder. Data were collected for the entire session. The data recording and organization was adapted from the Social Interaction Coding System tool (Rice, Sell, & Hadley, 1990) and Rowland, Schweigert, and Stremel's (1992) communication observation form. See Appendix K. Each disc was analyzed to record each interaction. If communicative attempts were separated by more than 5 seconds or there was a change in partner this was marked as a separate interaction. Each turn was coded as an initiation or a response. The communicative forms were noted as well.

Reliability

Reliability was computed on forty percent of the ten sessions. A second observer, a graduate student in speech-language pathology, viewed the recorded sessions and recorded data. Reliability was first determined on the occurrence of interactions. Interaction reliability was determined for four out of the ten sessions. Reliability across these four sessions was 59.5%. Due to the low inter-observer agreement for interactions, each recording was reviewed by the investigator and second observer together to obtain

consensus on the occurrence of the interactions. Once consensus was reached, the reliability for the coding was determined. Coding reliability was 100% for interactions.

Data Analyses

This study utilized descriptive statistics and visual analysis to compare initiation and response patterns of the children between treatments.

Chapter III

Results

This study compared initiations and responses of two preschoolers with autism using a picture communication board and a speech generating device (SGD). An alternating treatment design was used.

Participant A. Within the alternating treatments Participant A initiated and responded more with the picture communication board. See Table 2 and Figure 3. He used the device a total of three times during the intervention sessions to respond, and the picture communication board a total of four times, twice to initiate and twice to respond.

Table 3

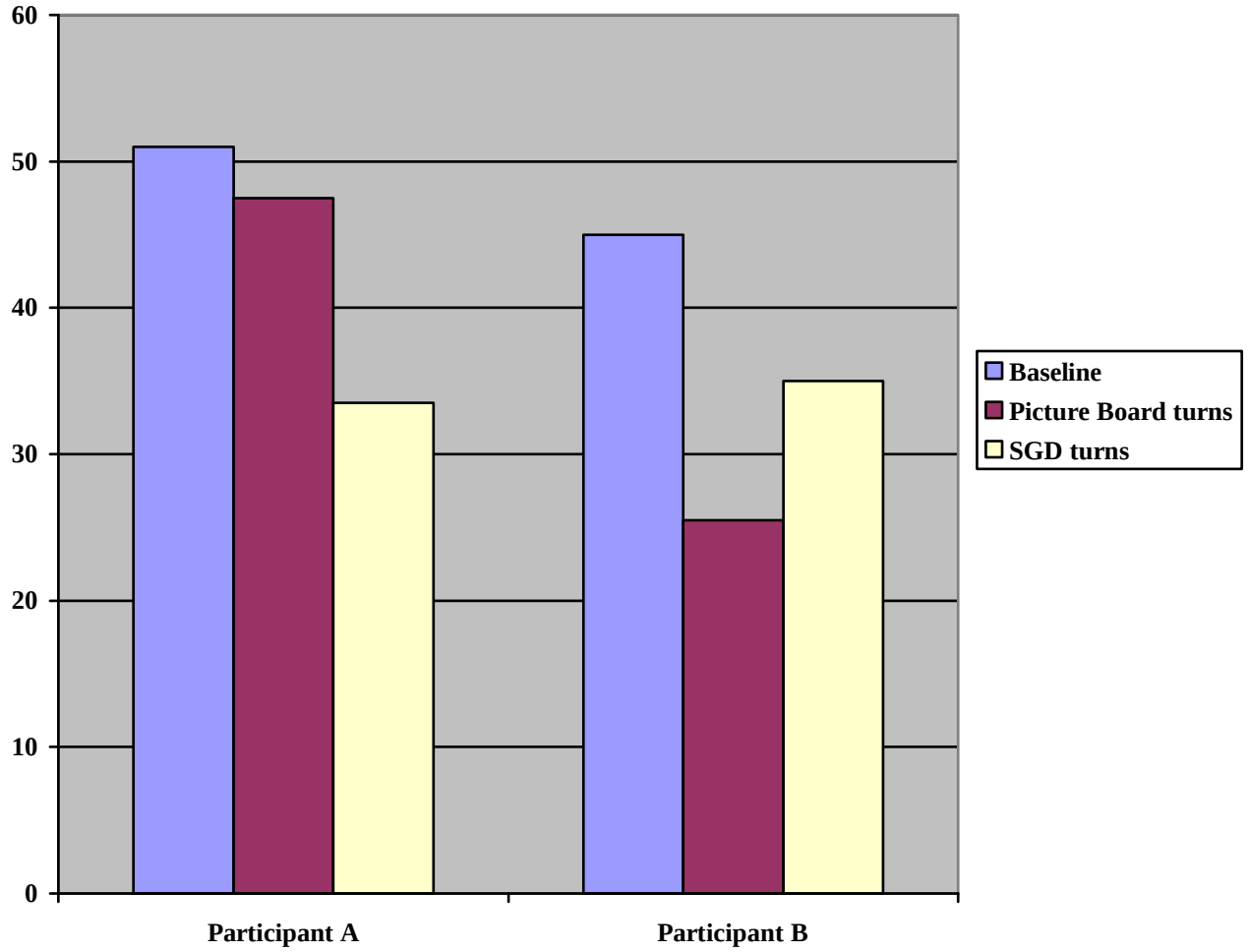
Participant A: Initiations and Responses

	Initiations	Responses
Picture Communication Board	2 (10%)	2 (3%)
Speech Generating Device (SGD)	0	3 (6%)

Note. Percentages represent the percent of total initiations and responses that the devices were used

Figure 3

Average Number Turns Per Condition



Participant B. Overall, Participant B initiated and responded more frequently when using the SGD. See Table 3 and Figure 3. He used the SGD a total of forty times (3 initiations, 37 responses), and the picture communication board twenty times (1 initiations, 19 responses).

Table 4

Participant B: Initiations and Responses

	Initiations	Responses
Picture Communication Board	1 (10%)	19 (46%)
Speech Generating Device (SGD)	3 (43%)	37 (59%)

Note. Percentages represent the percentage of total initiations and responses across conditions.

Chapter IV

Discussion

The participants in this study varied in their use of the two AAC systems to initiate and respond. Participant A, used the picture communication board more frequently during this study and mostly to respond. Participant B used the SGD more frequently and also mostly to respond.

Experience with types of AAC by each of the participants may be related to in what they preferred to use. Participant A may have been more inclined to use the picture communication board as that is what he has had experience with in the PECS system he had been exposed to. Participant B is from a home where technology is used, and has had experience, though minimal, with an SGD at school. Although these systems are not used throughout the day consistently in either of the participants' cases, it may have influenced the results of the study.

The results also indicate that learning how to communicate with an aided communication system takes time. In a case study conducted by Von Tetzchner et al. (2004), it took a four-year-old preschooler a few months to effectively use her picture communication system. By the time she finished preschool a year later, she had effectively learned to communicate with 80 pictograms. Drager et al. (2004) examined the acquisition of different layouts on an AAC device by preschool children who were developing typically over a five session period. Each session lasted two hours. The children who did not have communication or other challenges, averaged knowledge of only a few vocabulary items during the first session, and increased from between five and eight out of eighteen, varying by layout of vocabulary, by the end of the study. The

present study may have been too brief to compare the system particularly with children with autism who may take longer to transition to new contexts, new people, and new demands.

Participant B used both devices more than Participant A. This could have been due to his age and consequent longer participation in school programs. It appeared to take less time for him to transition and acclimate to the setting and activities than Participant A.

Although it was not a purpose of this study, the AAC device vocabulary patterns used by each participant were also examined. It was found that the vocabulary that regulated others were most frequently used. Participant A used "stop" five of the seven times he interacted using a device. Participant B used "more" twenty-six times of the forty times he used a device to interact. Participant B also used "go" (eight times), and "all done" (six times). It did not matter what AAC system was present, the participants were able to learn to regulate other's behavior with it. It is also interesting to note that both participants were able to learn, even in four sessions, to use two communication systems.

Limitations

There were several limitations in this research. One was the limited number of sessions offered the participants to learn the systems. The participants received only two opportunities with each type of aided communication system. Just as they began to demonstrate knowledge of how to use each system, the study ended.

Another limitation was the number of participants in the study. Despite continued efforts, only two participants who met most of the selection criteria were available. As

autism is a very heterogeneous population, two participants are not representative of the total population.

Participants may have also benefited from being seen in the home, a more natural and familiar environment. It was often difficult for the participants to engage in the session due to their unfamiliarity with the setting and the researchers. ASHA guidelines for Treatment of Autism Spectrum Disorders Across the Life Span (2006) states that a natural learning environment yields more initiations and better generalization.

Future Research

Future research could replicate this study with more sessions and more children with autism. The research context could be in the child's home and perhaps with more familiar toys and routines.

Since it was found that the constant, repeated vocabulary items were more frequently used then the changing vocabulary, a study may be performed to explore if this affects the number of times the vocabulary item is used.

Another direction of future research could take would be using a visual scene display as opposed to a grid on a dynamic device. A visual scene display incorporates vocabulary into a contextual picture (e.g., digital photograph) on an AAC device and have been found to be effective with young children (Drager, Light, Speltz, Fallon, and Jeffries, 2003).

Conclusion

The purpose of this study was to compare the effect of an SGD and a picture communication system on initiations and responses in children with autism spectrum disorders. The findings from this study were mixed. Performance of each of the two

participants varied across the devices used. AAC has potential to have a positive impact on interactions as each participant was able to learn and utilize both systems in two sessions. AAC should be an option for children with autism spectrum disorders.

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Appendix A: Flyer Sites

Language Acquisition Preschool
Sunshine Acres Preschool
Community Children's Center- Head Start
Raintree Montessori School
Hilltop Child Development Center
Brookcreek Learning Center
Ballard Child Care Center
Stepping Stones
East Heights Early Childhood Developmental Center

Resource Centers
Lawrence Autism Society

Appendix B: Flier

Looking for:
Preschoolers with autism to participate in a study at the University of Kansas Schiefelbusch Speech and Hearing Clinic

Is your child:

1. **3-5 years old?**
2. **Diagnosed as being on the autism spectrum?**
3. **Nonverbal or have limited communicative abilities (doesn't speak as main way to communicate; fewer than 20 words used regularly)?**

If yes to all of the above, then we would like to have them participate in a study that will train them in using two forms of augmentative alternative communication.

For more information please contact:

Katylin Brown (785-766-7414)
or
Melissa Shaver (816-803-4165)
Or
Dr. Jane Wegner (864-4690 or Jwegner@ku.edu)

Appendix C: Invitation Letter to Participate

Dear parents,

We are graduate students in the Speech- Language- Hearing Department at the University of Kansas in Lawrence. We are conducting thesis research with young children with autism spectrum disorders (ASD). Specifically, we are interested in whether children with ASD communicate more when they are taught to use a speech generating communication device or when they are taught to use a picture symbol board.

We are looking for children who:

1. Are between the ages of 3 and 5
2. Have been diagnosed with autism spectrum disorder
3. Do not speak many words or phrases (less than 20 words)

During the study, we will provide intervention at the Schiefelbusch Speech and Hearing clinic on the University of Kansas campus using both pictures and a communication device. Intervention will take about 4 weeks for each child and sessions will take place twice a week for 30-45 minutes. If you would be interested please feel free to contact us at 785-864-4690 or email Jwegner@ku.edu. We will then provide you with more detailed information about our study.

We appreciate your kind consideration.

Sincerely,

Melissa Shaver
Student Researcher

Katylin Brown
Student Researcher

Jane R. Wegner, Ph.D., CCC-SLP
Faculty Advisor

Appendix D: Introduction Letter for school administrators

Dear administrator:

We are conducting research to determine if young children with autism initiate more and use more communicative functions when using picture communication systems or a speech generating communication device. We are looking for children who:

1. Are between the ages of 3 and 5
2. Have been diagnosed with autism spectrum disorder
3. Do not speak many words or phrases (less than 20 words)

Would you please hand out these flyers to any families that have a child who meets these requirements and would you please hang one up in as prominent place in your school. If you have any questions, please contact us at 864-4690 or Jwegner@ku.edu. Thank you for your time.

Sincerely,

Melissa Shaver
Student Researcher

Katylin Brown
Student Researcher

Jane R. Wegner, Ph.D., CCC-SLP
Faculty Advisor

Appendix E: Newspaper Announcement

ANNOUNCEMENT:

University of Kansas graduate students are seeking preschoolers (ages 3-5) diagnosed on the autism spectrum who use no more than 20 spoken words (nonverbal) to participate in a study that will investigate their communication using a communication device that speaks and picture boards.

For more information please contact:
Melissa Shaver, Katylin Brown or Dr. Jane Wegner
Schiefelbusch Speech-Language-Hearing Clinic
University of Kansas
785 864 4690

Appendix F: Listservs where announcement was posted

kansasautismadvoc · Kansas Autism Advocacy
faithinourchildren · **Faith** In Our Children Support Group
autismandaspergerssyndromeinkansas · Autism and Aspergers syndrome in Kansas
Kcmetrosupport_autism · Kc Metro Autism Spectrum Support
heartlandfeat · Heartland Feat

Appendix G: Consent Form

COMPARISON OF AAC INTERVENTIONS FOR PRESCHOOLERS WITH AUTISM

INTRODUCTION

The Department of Speech Language Hearing at the University of Kansas supports the practice of protection for human subjects participating in research. The following information is provided for you to decide whether you wish your child to participate in the present study. You may refuse to sign this form and not allow your child to participate in this study. You should be aware that even if you agree to allow your child to participate, you are free to withdraw at any time. If you do withdraw your child from this study, it will not affect your relationship with this unit, the services it may provide to you, or the University of Kansas.

PURPOSE OF THE STUDY

The purpose of this research is to compare communication of preschool children with Autism Spectrum Disorders when they are using a picture communication board as opposed to a speech generating communication device while playing with a researcher. We want to know if they use one system more than the other, if they initiate communication (try to tell researcher things that are not in response to a question), and if they communicate for different purposes (requesting, commenting, protesting) with one system more than another.

PROCEDURES

Once you have expressed interest in your child participating in this study, you will receive a MacArthur-Bates Communicative Development Inventory (to help us understand how much language your child has) will be used to determine if your child meets the requirements to participate in this study. To participate in this study your child will be asked to attend 9 sessions 30-45 minutes in length. The first session will be a play session with the researcher in which neither the picture communication board nor the speech generating device will be used. In each of the following 8 sessions your child will play with the researcher but will have either the communication device or a picture board to use. Each session will take place in the Schiefelbusch Speech Language and Hearing Clinic. The sessions will each have a play theme and play activities such as book reading, art (making something that we read about) and motor activities (making objects do what they do in the story). During the session the researcher will model the vocabulary that is on the device being used that day. It will be recorded how many times the participant comments and requests, and what they did to convey their message. Each session will be videotaped and these tapes will be kept in a locked room, in a locked

cabinet at the Schiefelbusch Speech Language and Hearing Clinic for two years after the end of the study. These tapes will be analyzed.

RISKS

There are no anticipated risks in participating in this study.

BENEFITS

During this study, the researchers hope to learn more about the communication patterns of children with autism, and more specifically the participant's communication, so that we can share this information with you, the caregivers. The researchers also hope to gain insight into a device that may help your child better communicate their wants and needs by expanding their language knowledge.

PAYMENT TO PARTICIPANTS

No payment will be involved in this study.

PARTICIPANT CONFIDENTIALITY

Your child's name will not be associated in any way with the information collected about them or with the research findings from this study. The researchers will use a study number or a pseudonym instead of your child's name. The researchers will not share information about you unless required by law or unless you give written permission about your child. Permission granted on this date to use and disclose your child's information remains in effect for the next five years. By signing this form you give permission for the use and disclosure of your child's information for purposes of this study at any time in the future.

REFUSAL TO SIGN CONSENT AND AUTHORIZATION

You are not required to sign this Consent and Authorization form and you may refuse to do so without affecting your right to any services you are receiving or may receive from the University of Kansas or to participate in any programs or events of the University of Kansas. However, if you refuse to sign, your child cannot participate in this study.

CANCELLING THIS CONSENT AND AUTHORIZATION

You may withdraw your consent for your child to participate in this study at any time. You also have the right to cancel your permission to use and disclose information collected about your child, in writing, at any time, by sending your written request to: Melissa Shaver and Katylin Brown at 2101 Haworth Hall, 1200 Sunnyside Ave, Lawrence, KS 66045-7534. If you cancel permission to use your child's information, the researchers will stop collecting additional information about them. However, the

research team may use and disclose information that was gathered before they received your cancellation, as described above.

QUESTIONS ABOUT PARTICIPATION

Questions about procedures should be directed to the researchers listed at the end of this consent form.

PARTICIPANT CERTIFICATION:

I have read this Consent and Authorization form. I have had the opportunity to ask, and I have received answers to, any questions I had regarding the study. I understand that if I have any additional questions about my child's rights as a research participant, I may call (785) 864-7429 or (785) 864-7385 or write the Human Subjects Committee Lawrence Campus (HSCL), University of Kansas, 2385 Irving Hill Road, Lawrence, Kansas 66045-7563, email dhann@ku.edu or mdenning@ku.edu.

I agree to allow my child to take part in this study as a research participant. By my signature I affirm that I have received a copy of this Consent and Authorization form.

_____ _____

Type/Print Participant's Name Date

_____

Parent/Guardian Signature

Researcher Contact Information

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Appendix H: Preference Form

Parents,

Please rank these themes according to your child's interest (1= most interesting and 10 = least interesting). This will help us to get a better idea of the activities that will most interest your child. Thank you!

___ Transportation
___ Building
___Bugs
___Around the house
___At school
___At the park
___Going Shopping
___Dinosaurs
___Actions (jumping, playing, reading etc)
___Frogs and animals

Appendix I: Sample Session Plan

Goals: Compare how a child is communicating initiations and communicative functions, and the frequency of use when using a picture communication board versus a speech generating communication device.

Consistent vocabulary always present on the device: More, Turn the Page, My turn, Your turn, all done, Stop, Go, I want

Theme Based Vocabulary: Rocket, Boat, Airplane, Motorcycle, Hot air balloon, Car, Sticker please
***Each of the 14 vocabulary items will be modeled 5 times (once during story reading, once during story review, and then 3 additional times during play activities; EXCEPT for "Turn the Page" which will be modeled on 5 of the pages before giving the child the opportunity to communicate that vocabulary item). When a total of five is reached, the data collector will signal to the researcher that she can no longer model that vocabulary item.

1. Read the participant the verbal assent procedure.

2. Give the participant the system that they will be using that day (the picture communication board or the Speech Generating Device).

3. Read the pop-up story Ready, Set, Go. After a page is read, introduce the vocabulary by modeling the word in speech, pointing to the picture in the book and then point to the picture/ perform the action represented on the child's communication device.

Page 1: Rocket, turn the page
Page 2: Boat, turn the page
Page 3: Plane, turn the page
Page 4: Motorcycle, turn the page
Page 5: Hot air balloon, turn the page
Page 6: Car, turn the page

4. Point to "More" on the communication device and then review the vocabulary items by again modeling the word in speech, pointing to the picture in the book and then pointing to the picture/ performing the action represented on the child's communication device.

5. Allow the child to choose an activity from the following:

- Driving cars and motorcycles around on a car mat (using vocabulary from the story as well as "my turn", and "your turn" on the communication device).
- Making a rocket ship by decorating a toilet paper roll with stickers (use "sticker please", "More" etc. from the communication device) and placing a piece of paper shaped like a cone over the top.

- Floating a boat in a small bucket of water that has a cover for when it is time to move to a new activity. .
- Make paper airplanes fly through the air and model vocabulary usage from the device.
- Fly a pre assembled hot air balloon (made out of a small balloon with a basket attached to the bottom).
- Use Magnetic Board with space scene to place various space magnets (Rocket, stars, moon, aliens etc) on the board.

Appendix J: House Vocabulary Grid

Participant_____ Date _____ Session #_____

Assent Procedures Read _____

Vocabulary Word	**Number of Times Presented**									
More										
My Turn										
Your Turn										
All Done										
Stop										
Go										
I want										
Kitchen										
Living Room										
Bathroom										
Bedroom										
Garage										
House										
Room										

Appendix K: Data Collection Form

Data Collection Form (SICS)

Child's Name: ________________________ Date: _________ Time: _______________

Observer: ____________________________ Theme:______________________________

Play Activity	Verbal Interactive Status	Form	Function	Content/ Message

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