Vocabulary Learning Across Two AAC Systems in Children

Research Thesis

Presented in partial fulfillment of the requirements for graduation

with research distinction in Speech and Hearing Science in the undergraduate

colleges of The Ohio State University

by

Simone Dollenmayer

The Ohio State University
December 2019

Project Advisor: Allison Bean, Department of Speech and Hearing Science

INTRODUCTION

Augmentative and Alternative Communication (AAC) systems are used by individuals who are unable to communicate using spoken language (Dukhovny & Soto, 2013). The American Speech-Language Hearing Association (ASHA) defines AAC as follows: "Augmentative and alternative communication (AAC) refers to an area of research, clinical, and educational practice. AAC involves attempts to study and when necessary compensate for temporary or permanent impairments, activity limitations, and participation restrictions of individuals with severe disorders of speech-language production and/or comprehension, including spoken and written modes of communication" (2005, p.1). One type of AAC system is a high-tech speech generating device (SGD). Upon selection of a particular item, an SGD will generate a computerized voice. These devices enable individuals to effectively and efficiently participate in an assortment of activities and interactions at their own discretion (Dukhovny & Soto, 2013). People who use AAC (PWUAAC) systems are diverse in age, socioeconomic status, race, and ethnicity, but all possess the need for adaptive support to meet all of their communication needs (Beukelman & Mirenda, 2013).

Fast Mapping on Augmented Communication Systems

Like verbal language learning, children who are learning language on an AAC system must learn new vocabulary. Fast mapping is the first step in learning vocabulary (Beukelman & Mirenda, 2013). This process is the ability to create preliminary links between a new word and its referent after minimal exposure. The first link created in fast mapping is delicate, as such, a second stage of mapping is necessary to increase the likelihood of the newly learned word becoming part of the child's lexicon. The initial fast map is followed by a stage of slow mapping during which time individuals solidify their semantic knowledge of the word (Beukelman & Mirenda, 2013). Although fast mapping is a critical step in the word learning process for individuals who are verbal and PWUAAC, to date, only a limited number of studies have been conducted exploring fast mapping on augmented communication systems.

Studies conducted by Wilkinson and colleagues (2001) explored the relationship of fast mapping and individuals with severe cognitive deficits. One study examined the fast mapping process of two participants with intellectual disabilities. The first participant was eight years old, while the second participant was 14, both utilizing visual symbols in an augmented communication system for expressive language (Wilkinson & Albert, 2001). Both participants' educational goals involved expanding their symbol inventories to include written and sight words (Wilkinson & Albert, 2001). The study made accommodations for the participants based on the severity of their individual needs; the first participant received an extensive program with various aspects of learning while the second participant's teaching procedures were made more time-efficient (Wilkinson & Albert, 2001). Both participants used symbol-based AAC systems but the researchers wanted to expand the type of AAC to include written and sight words in a way that was consistent with the participants' IEPs (Wilkinson & Albert, 2001). The participants' fast mapping was adapted to extend to sight words. For this teaching, researchers contrasted new and known words to support the fast-mapping process (Wilkinson & Albert, 2001). The individuals with intellectual disabilities in this study were able to integrate newly learned words directly into pre-existing categories of symbols without explicit instruction (Wilkinson & Albert, 2001). A limitation of this study is the fact that the individualized adaptations made were made to best suit each participants' needs. As such, generalizations for all AAC users was hindered. However, this study does indicate that individuals with intellectual disabilities who use AAC as their primary mode of communication are able to fast map new words when the fast-mapping process is individualized to support their learning needs.

Wilkinson and colleagues (2009) conducted another study on the ability to link different types of categories within the fast mapping process in individuals with severe deficiencies of language, and intellectual disabilities. Three experimental categories were created, each encompassing one spoken word, one photograph, and one visual-graphic lexigram (Wilkinson, Rosenquist & McIlvane, 2009). Each category was linked to a specific word. For example, the word “rok” referred to both a photograph and a visual-graphic lexigram. This mapping is similar to the mapping individuals would need to create to learn words on an AAC system (i.e., a link between a word, a referent, and a symbol). Initial relations were taught among the categories. The ten participants ranging from age eight to age 19 (mean age: 13 years, 8 months), all with severe intellectual and language limitations, acquired these initial relations and demonstrated this knowledge nearly error-free (Wilkinson, et al., 2009). In other words, individuals with low language scores scored exceptionally well in equivalence-class formation tasks (Wilkinson, et al., 2009). Equivalence-class formation involves forming categories of words and placing newly learned words into pre-existing categories (Wilkinson, et al., 2009). The results revealed that simple category formations are possible despite having an extremely limited vocabulary. This implies that fast mapping can be explored in individuals with similarly low levels of vocabulary knowledge, as fast mapping can be adapted for looking at the lexical processes of those with developmental disabilities.

A research study conducted at Ohio State University investigated the ability of typically developing (TD) college-aged adults to fast map novel words on an AAC device. In addition, researchers examined what mechanisms (visual spatial memory or verbal working memory) were associated with vocabulary learning on different types of AAC systems. Participants were taught novel objects and actions on both a motor-based and a symbol-based system. The cognitive load of teaching was varied across participants; half were taught six words per visit and half were taught ten words per visit (Bean, Kryc, Dollenmayer, Lyle & Paden Cargill, 2019). After an initial teaching session, an expressive testing and then a receptive testing session followed (Bean, et al., 2019). The results of this study provided insight on the process of fast mapping on an SGD, and the basic process in TD adults. All of the adults learned the novel words after a single teaching session. Across participants receptive vocabulary scores were higher than their expressive vocabulary scores. Visual spatial memory was correlated with performance on two separate AAC modalities (symbol and motor-based systems) and that receptive knowledge is greater than expressive knowledge of novel vocabulary after just a few exposures (Bean, et al., 2019). The findings of this research reveal that typically developing adults are able to fast map novel words on two differently designed AAC systems after a single teaching session and that the mechanisms that underlie fast mapping on AAC systems (i.e., visual spatial memory) may differ from those that underlie verbal fast mapping.

While it is clear the children with severe intellectual disabilities are capable of fast mapping words on augmented communication systems, to date, little is known about the fast mapping process or what mechanisms underlie fast mapping on SGDs in preliterate children who are typically developing. Our decision to first investigate this phenomenon in TD children will enable us to develop a framework for understanding this process that may be applied to investigate fast mapping on AAC systems in children with cognitive, speech, and/or language impairments. We chose to use pre-literate children in order to limit the amount of symbol learning (in this instance defined as reading) children have had exposure to in order to determine whether individuals with more limited symbol learning demonstrate better vocabulary learning on symbol or location-based AAC systems.

From a very young age, children are capable of linking spoken words and symbolic referents. A study examining knowledge on symbols in 18 and 24-month old children taught children a new word using a picture of the object and then later asked them to select the objects when prompted with the newly learned word. For example, children were taught what a “whisk” was using a picture of a whisk. When asked “what is a whisk?” the majority of children selected the object, as opposed to the picture of the object (Preissler & Carey, 2004). The results of this study revealed that the process of word learning involves an assignment of meaning and it is not just a matter of association (Preissler & Carey, 2004). At a pre-lingual level, symbols have less meaning than they do to verbal individuals. This research study exposed that prelingual, typically developing children have the ability to map symbols and referents in learning new words object (Preissler & Carey, 2004).

Although previous research has shown that prelingual children are capable of making symbol-referent associations, it remains unclear whether preliterate children would demonstrate better learning on a symbol-based AAC system or a location-based system.

Symbol-based systems provide an unchanging graphic referent to which the learner can recurrently refer back (Buekelman & Mirenda, 2013). Therefore, the same unique symbol reliably links to the same referent. With the addition of new vocabulary to the device, there is a possibility that the symbol shifts to a location differing from where the user learned it. Consequently, the user must be able to recall the visual representation of the symbol, rather than its location. Symbol-based AAC systems resemble early readers learning sight words, as the sight words act as symbols in reading. Location-based systems resemble the motor movement of the articulators in typical development (recalling the pattern of the AAC system rather than moving the articulators) (Beukelman & Mirenda, 2013). The differences found in these varying modalities may result in more successful vocabulary learning for a particular user than another. The success of the varying models may also be related to the cognitive load of a learning task.

Thistle and colleagues (2008) explored the difference in learning between a system where symbols stay in a consistent location, versus a system where symbols' locations vary. The exploration of a motor-based system compared to a symbol-based system revealed that there was no difference in participant response time in the first session, but by the fifth session participants in the consistent symbol location condition were faster than those in the varying symbol location group (Thistle, Holmes, Horn & Reum, 2018). The finding that there is an advantage of a consistent symbol location on augmented communication devices in typically developing children can likely extend to developmentally delayed children as visual processing and motor challenges could influence a child's ability to locate and select symbols in a way that would disrupt motor learning in the condition of varying symbol location (Thistle, et al., 2018). Our second research question was developed based on these findings, as we viewed two different types of AAC systems, a location-based system and a symbol-based system to determine whether learning differed across these types of systems.

It is also notable that the three studies (Wilkinson & Albert, 2001., Bean, et al., 2019., Thistle, et al., 2008) that examined fast mapping on AAC systems did not assess retention, to my knowledge, only one study has examined fast mapping and retention of words, facts, and pictograms. Deák and Toney (2013) investigated this in TD 4- and 5-year-old children. They discovered that children learn words slower than facts and pictograms, as they learned more facts and pictograms than words at an initial visit, but in following exposures they scored equally in correctly identifying facts, pictograms and words (Deák & Toney, 2013). They found that receptive vocabulary appeared to be the only predictor of retention (Deák & Toney, 2013). The ultimate results of this study are as follows: fast mapping is a broad learning capacity that can occasionally (usually in very simple contexts) lead to retention (Deák & Toney, 2013).

To summarize, all individuals have unique preferences to their personal style of communication. When clinicians are selecting AAC devices for their clients, it is vital to choose a device that complements the individual's preferences and needs (ASHA, n.d.). This study focuses on two widely used AAC systems, a location-based system and a symbol-based system. These two systems resemble different learning styles. The location-based system resembles moving articulators in a specific pattern to produce a spoken word, or the motor production of speech. Rather, the symbol-based system mimics the early readers learning sight words. These sight words are utilized by children to quickly identify commonly used vocabulary words. The same skills used for identifying sight words are used in selecting a symbol on a symbol-based AAC system. Not only is the initial learning of vocabulary important, retention is just as significant, if not more. The goal is for PWUAAC to retain their vocabularies in order to best satisfy their communicative needs in a variety of situations and environments. In order for a clinician to select the best system for a client, evidence-based practice should be utilized to grasp how an individual's learning style will influence success in preserving words learned on a particular system.

CURRENT RESEARCH STUDY

This study focuses on three important questions relating to children learning vocabulary on AAC devices and preserving it. In particular I sought to answer the following research questions:

1) Can children map words after a single teaching session? Previous research (Bean, et al., 2019) found that TD adults were able to fast map words after a single teaching session. I predict that preschool children, like TD adults, will have the ability to fast map a new word after a single teaching session.
2) Is there a difference in word learning on symbol-based versus location-based systems? Location and symbol-based systems are prescribed to PWUAAC. It remains unclear whether pre-literate children would demonstrate better learning on an AAC system that mimics verbal speech development (i.e., a location-based system) or a system that is similar to learning sight words (i.e., a symbol-based system. If there is a difference, this suggests that clinicians may choose to consider individuals' symbol experience when choosing what type of AAC system to prescribe.
3) Is there a difference in retention on symbol-based versus location-based systems? This is the first study to investigate retention of newly learning words on an AAC system. Based on the work of Deák and Toney (2013), I predict that children will retain some of the newly learned words. However, it remains unclear whether one type of system results in better retention than another.

METHODS

Participants. IRB approval for this study was granted by The Ohio State University. A total of 12 children were enrolled in the study. Two children were excluded because they did not complete any of the visits and one child was excluded because of familiarity with the stimulus. I report on data from a total of 9 pre-school aged boys (n=5) and girls (n=4) with a mean age of 4 years, 6 months (range = 3 years, 6 months - 5 years,10 months). Children were recruited into the study through The Ohio State University's Speech and Hearing Department. The research conducted was a mixed design. The within-subject variable was the type of AAC system; children were randomly assigned to first be taught words on a location-based system or a symbol-based system. The parents of the participants completed a background history form comprised of questions concerning demographic information, and history of speech and language delays. To be included in the study, participants needed to score within 1.5 standard deviations of the mean on the standardized tests of receptive vocabulary and nonverbal cognition. None of the participants had a history of hearing loss or were reported to hear another language on a regular basis. One child was reported to have a history of speech and language delay; however, her scores fell within 1.5 standard deviations of the mean making her eligible for participation in the study. Please refer to Table 1 for participant demographics.

Table 1. Participant Demographics

Gender Male (Female)	Age M (SD)	KBIT M (SD)	PPVT-IV M(SD)	CORSI M(SD)	VWM M(SD)
5(4)	4.66 (.68)	115.14 (13.69)	121.29 (10.98)	2.11 (1.62)	4.00 (2.65)

Note. KBIT = Kaufman Brief Intelligence Test; M = mean; PPVT-IV = Peabody Picture Vocabulary Test, Fourth Edition; SD = standard deviation; VWM = Verbal working memory

Materials and Procedures

Standardized Tests: The matrices portion of the *Kaufman Brief Intelligence Test, Second Edition* (KBIT-2; Kaufman, 2004) was administered. This subtest of the KBIT-2 assesses nonverbal perception. In this test, “the individual selects which one of the five pictures goes best with a stimulus picture (e.g. a car goes with a truck, a fish goes with an aquarium); (Kaufman, 2004). This test has a mean standard score of 100 (SD= +/- 15). To examine receptive vocabulary, the *Peabody Picture Vocabulary Test, Fourth Edition* (PPVT-4; Dunn, 2007) was utilized. Individuals are asked to point to one of four pictures that matches a given verbal stimuli throughout the test (e.g., if the word given was “painting” the individual would point to the image of a paintbrush). This test has a mean standard score of 100 (SD = +/- 15) and high reliability and validity.

The CORSI block tapping task (https://www.psytoolkit.org) was utilized to measure nonverbal spatial working memory. During the test, participants view blocks lighting up in a pattern. Post-viewing, they are prompted to click the pattern of the blocks in the same order that was observed. As the participant progresses further along the test, the number of the blocks lighting up in the pattern increases. Higher CORSI block scores denote greater visual spatial working memory capabilities.

A verbal working memory assessment (DeDe, Ricca, Knilas & Trubl, 2014) that served as an indicator for verbal working memory exclusive of an expressive language component, required participants to point to pictures in a specific order. During the test, the participant heard a list of words (e.g., “school, boy, moon, fish”) while looking at a blank sheet of paper. Once finishing the list of words, the researcher flipped to a page in the stimulus book that contained nine images (containing the words previously stated aloud). The participant pointed to the appropriate pictures in the order that they had previously heard them without speaking out loud. If the participant correctly completed the task, they received one point. A greater number of points at the end of the assessment indicated enhanced verbal working memory.

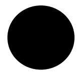
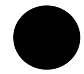
Experimental Stimuli: The experimental stimuli consisted of four novel objects and four novel actions. The Novel Object and Unusual Name Database (NOUN; Horst & Hout, 2016) is a compilation of names and objects that were regarded as novel through name-ability and object familiarity scores that can be used in research (Horst & Hout, 2016). For both name-ability and object familiarity, high scores were considered less-novel. These novel names were taken to create both nouns and verbs in this study.

Novel objects. The four novel objects were selected from the NOUN database to serve as referents for the novel words being taught in this study. The objects utilized in this study were chosen based on low familiarity and name-ability scores. (see Table 2)

Novel actions. A researcher filmed another lab member performing novel actions to function as a referent for the novel action words being taught. Two or more movements were combined to produce a new novel action. For example, sticking out one's tongue and plugging their nose were combined to create the novel action, "nilting." (see Table 2)

Table 2. Novel words and the associated symbol

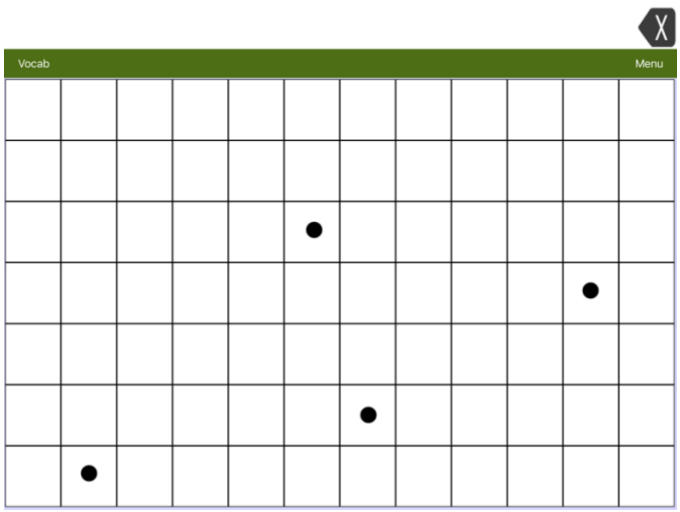
	Novel Objects			Novel Actions	
Novel Word	Symbol	Object	Novel Word	Symbol	Action
Hux	[redacted]		Glooping	[redacted]	Clapping while squatting

Krat			Rehling		Foot to knee and then foot to floor
Aker			Beeging		Jumping up and clapping heels together
Maudi			Nilting		Holding nose and sticking tongue out

AAC Systems. A location-based system and symbol-based system were designed to teach the novel words. Researchers customized programming to design the chosen varying symbol locations and constant locations of a consistent symbol on the Language Acquisition through Motor Planning (LAMP) Words for Life application on an iPad (Halloran & Halloran, 2006). LAMP Words for Life applies speech generating capabilities and motor planning techniques to facilitate communication for those with autism. Each experimental condition had tailored-made pages programmed on the application.

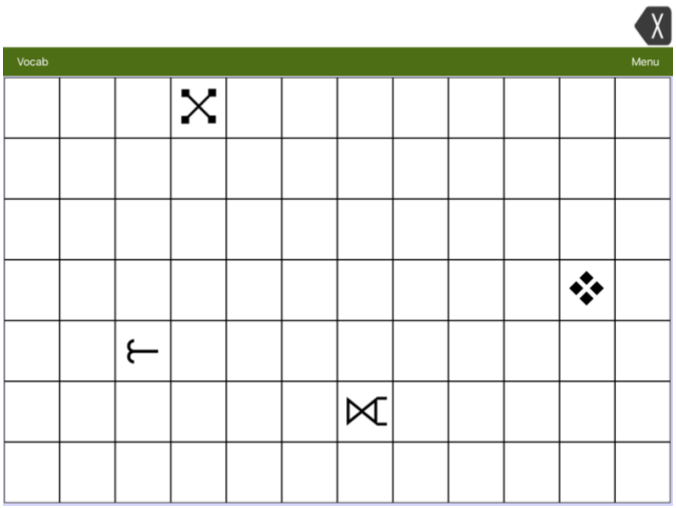
A unique, static location with a novel word name gathered from the NOUN database for the location-based system. When a participant selected the black dot of the correct location, the iPad's speech generating capability allowed the corresponding vocabulary word to be produced out loud (see Figure 1). All of the vocabulary words taught in the location condition required pressing one black dot on the iPad's screen. For example, to produce the novel word "hux," the black dot in the second row, and seventh column needs to be selected (See Figure 1). The use of the black dots ensured that participants learned the location, and not a connection between a particular symbol and the referent. If at any point during the teaching the subject did not select the correct dot, the researched would prompt correct production by pointing to the appropriate dot for the particular vocabulary word.

Figure 1. *The location-based condition display*



For the symbol-based system a unique symbol was linked to a particular name from the NOUN database (see Figure 2). The black and white symbols were chosen from various Microsoft Word fonts. For example, in the symbol-based system the word “beeging” referred to the action “jumping up and clapping heels together” which was represented on the symbol AAC system by selecting the “⋈⊏” symbol. For this symbol condition, four pages on LAMP were designed. Each page allowed for the symbol to be in an altered position on the page throughout the teaching session. This guaranteed that participants learned the specific symbol and not its location on the page. If at any point during the teaching process the subject did not correctly select the symbol, the researched prompted the symbol’s correct production by pointing to it on the page to cue the participant to select the appropriate symbol.

Figure 2. *The symbol-based condition display*



Experimental Design

The experiment was conducted in respectively the same order in both the location-based system and the symbol-based system. Expressive testing was done immediately after the teaching, and then the receptive testing followed. Retention was then tested three to seven days later. All participants were taught on both the location-based and symbol-based systems. The order of either receiving instruction on the location-based system or the symbol-based system first was randomized for all participants.

Teaching. Microsoft PowerPoints were developed for teaching the four novel words on the location-based system and the symbol-based system. The PowerPoint slides for the novel objects included two pictures of commonly known objects along with the picture of the novel object. In order to make the PowerPoint slides more engaging for the children, there was also a cartoon fish on all slides, named “Bubbles”, that “taught” the children all of the new words. Teaching protocol remained the same for all visits. Each word was presented six times. When teaching novel nouns, the researcher would say, “*Look it’s a* [researcher selects the appropriate word on the SGD], *What is it?* [participant selects the word on the SGD], *Wow! Another* [participant selects the word on the SGD], *I see a* [participant selects the word on the SGD], *This is called a* [participant selects the word on the SGD], *Look, it’s another* [participant selects the word on the SGD].” When teaching novel verbs, the researcher would say, *“Look she’s* [researcher selects the appropriate word on the SGD], *Look, she’s still* [participant selects the word on the SGD], *What is she doing?* [participant selects the word on the SGD], *She’s* [participant selects the word on the SGD], *Wow! There she is again, she’s* [participant selects the word on the SGD], *What is she doing again?* [participant selects the word on the SGD]”. The only difference across teaching sessions lied in whether the word was represented by a black dot in a constant location on the iPad (location condition) or a particular symbol in varying locations (symbol conditions).

Location-based system. Participants were taught that a black dot in a specific location linked to a novel object or action. First, the researcher demonstrated clicking the dot that in turn resulted in the iPad generating the novel name verbally. The researcher then turned the iPad over to the participant for the following five slides to generate the same word by clicking the dot in its static location that they had just learned. This structure remained constant for each of the four words taught. If the participant did not correctly click the appropriate dot at any time throughout the teaching the research stepped in by prompting the correct click by pointing to the correct dot and allowing the subject to complete the hit.

Symbol-based system. Participants were taught that a distinctive symbol corresponded with a novel object or action. First, the researcher pressed the symbol that's name was then generated verbally by the iPad. The researched then gave the participant the opportunity to press the same symbol and generate the same novel word on the iPad for the following five slides of the PowerPoint. This series of steps was constant for each of the four novel objects and action words taught. If the participant pressed the wrong symbol at any time throughout the teaching the researcher prompted the subject by pointing to the correct symbol and allowing the participant to click it.

Testing.

Testing was conducted immediately after teaching and then retention was tested three to seven days after the initial teaching. Both testing procedures followed the protocol described below.

Expressive. The expressive test immediately followed teaching. In a different order than the participant had beforehand learned, the expressive testing PowerPoint displayed a picture of each novel object or a video of each novel action. In the assessment of the location-based system, the dots were in the same location as they were in during teaching. In the assessment of the symbol-based system, the symbols were located in a different location on the grid than they were throughout the teaching. Consequently, a unique page design was used for each object or action tested. This ensured that the participant had learned the symbol itself rather than the particular symbol's location. During testing, the researcher requested that the subject name the novel object or action solely using the iPad. For the location-based system this meant clicking the correct dot while for the symbol-based system this meant selecting the correct symbol. Unlike teaching, in the testing portion of the visit, the iPad did not verbally generate the word when the participant clicked the dot or the symbol. One point was received for each object or action that the participant correctly named. An expressive vocabulary score was gaged by the total number of correctly named words out of the total four.

Receptive. The receptive vocabulary test immediately followed the expressive vocabulary test. Each slide on the PowerPoint for receptive testing displayed three pictures of novel objects or three videos of novel actions. Each novel object and action presented on the slide were taught in the teaching session. In the location-based receptive testing, the researcher selected a dot on the iPad and the participant identified which novel object or action on the slide corresponded with that dot. In the symbol-based receptive testing, the researcher clicked a symbol on the iPad and the participant then identified which novel object or action on the PowerPoint slide corresponded with that particular symbol. One point was given each time the participant correctly identified the corresponding object or action. A receptive vocabulary score was gaged by the total number of correctly named words out of the total four.

RESULTS

In order to determine if children could map words after a single teaching session, I compared the receptive scores to chance (.33). For the expressive scores I determined whether the participants were able to produce at least one word during testing (both immediate and retention). In the symbol condition, the receptive testing scores did not differ from chance immediately following teaching. However, children's receptive vocabulary scores for the symbol condition were significantly above chance during retention testing (p=.026). In the location condition, children's receptive vocabulary scores were significantly above chance (p=.002) when they were tested immediately after teaching. However, their receptive scores did not differ from chance during retention testing. In symbol expressive testing, all participants produced at least one word (range = 1-4). In symbol expressive retention testing, 6 out of 7 children produced one word (5 children only produced one word, and 1 child produced four words). In location expressive testing all participants produced at least one word. In location expressive retention testing, 7 out of 8 children produced at least one word (4 children produced one word, 2 children produced two words, and 1 child produced three words).

To examine if there was a difference in word learning on symbol-based systems versus location-based systems a paired samples t-test was conducted. In both expressive testing ($t(6)=.19$, $p=.85$) and receptive testing ($t(6)=1.18$, $p=.28$), there was not a statistically significant difference in word learning on the symbol-based system compared to the location-based system. A second set of paired samples t-tests were conducted to determine if there was a difference in retention on symbol-based versus location-based systems. In both expressive retention testing ($t(5)=1.17$, $p=.30$) and receptive retention testing ($t(5)=.67$, $p=.53$), there was not a statistically significant difference in retention of vocabulary on the symbol-based system compared to the location-based system. Please refer to Figure 3 and 4.

Figure 3. *Receptive Vocabulary Scores Across Conditions*

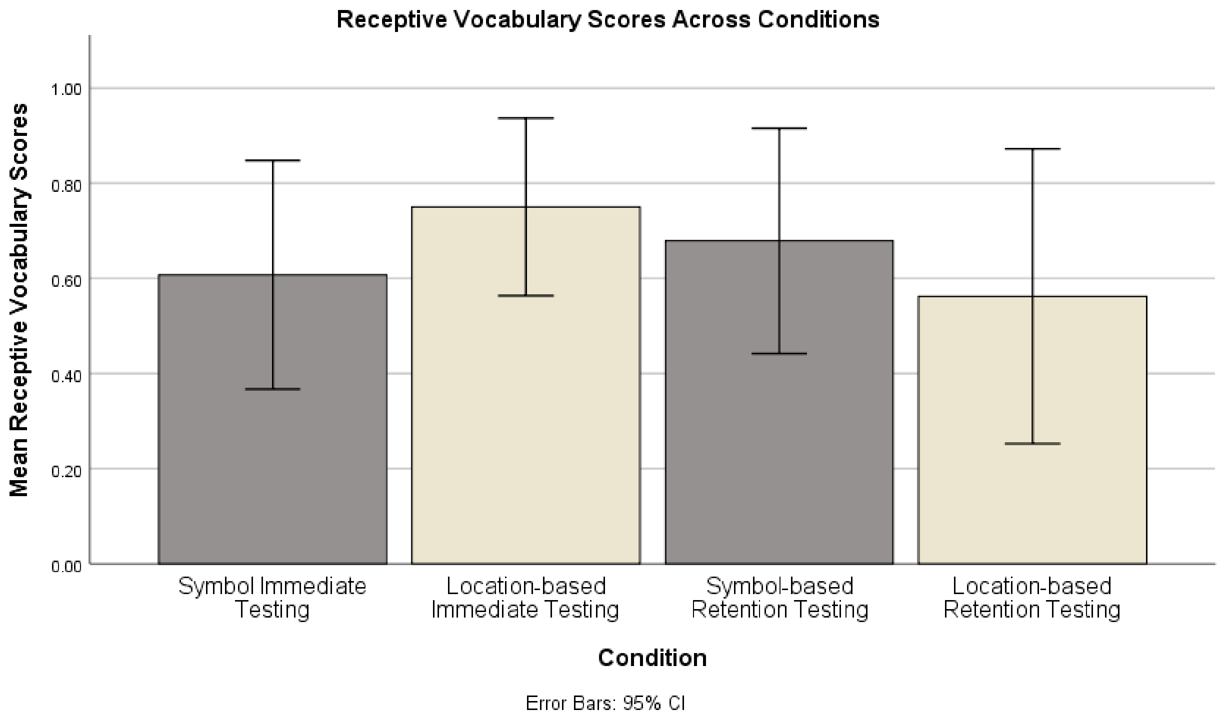
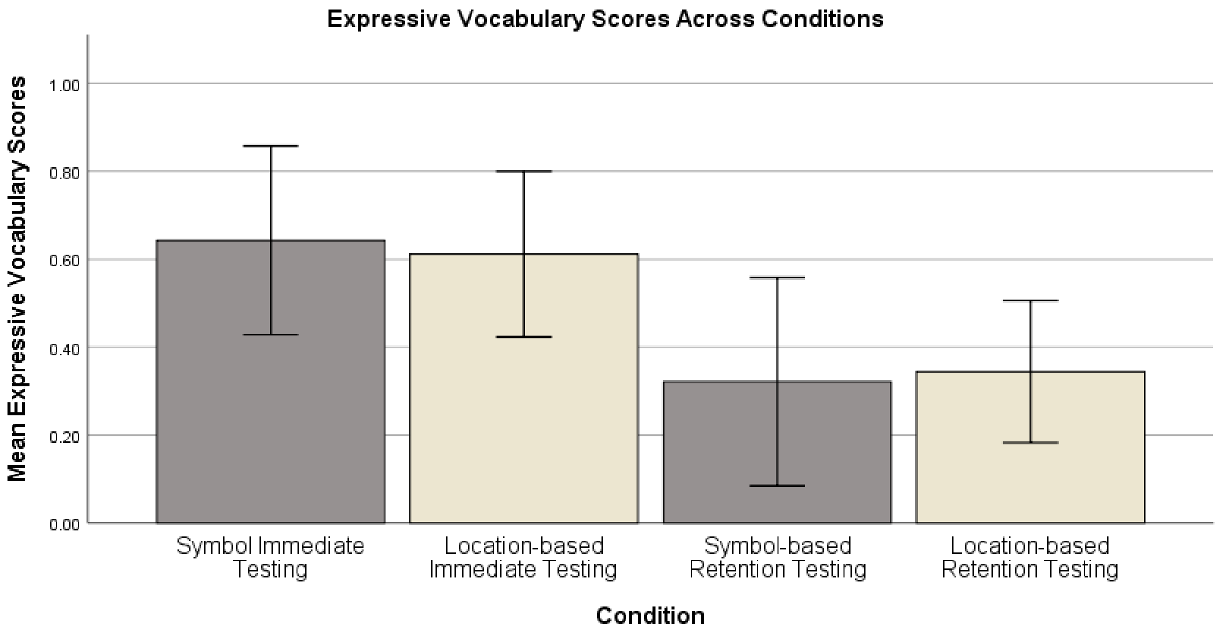


Figure 4. *Expressive Vocabulary Scores Across Conditions*



Error Bars: 95% CI

Error Bars: +/- 2 SE

DISCUSSION

This study examined the difference in fast mapping and retention on two different types of AAC systems, a location-based system and a symbol-based system. Overall, I found that there were no differences in fast mapping or retention whether the AAC device was location-based or symbol-based. I also found that children can map words on an AAC device after a single teaching session. Each of the findings will be discussed in greater detail below.

With regard to vocabulary learning, there was not a difference in receptive or expressive vocabulary learning based on the AAC system (symbol-based versus location-based). These results are consistent with the findings of Bean et al (2019) who reported that there was not a significant difference in typically developing adults' receptive and expressive vocabulary learning across symbol and motor-based AAC systems (Bean, et al., 2019). Although the results were consistent with previous research with typically developing adults, they differed from my prediction that preliterate children may perform better on a location-based system because it involves learning a motor plan that is similar to what is involved in verbal language whereas a symbol-based system is more akin to learning sight words. Although there were no group differences, it is possible that individual differences may influence learning across systems. One system may benefit a particular learning style, while the other system could benefit another learning style. Further research should be done to look at the influence of learning styles on the success of varying AAC systems for both fast mapping and retention.

Like typically developing adults (Bean et al., 2019), the preschool children in this study demonstrated learning after a single teaching session. In the immediate expressive testing, all of the children were able to produce at least one word in both the symbol and motor conditions. In the expressive retention testing, the majority of children were able to produce at least one word whether in the symbol or location condition. In the immediate receptive testing, on the location-based AAC system children's scores were significantly above chance. However, their receptive vocabulary scores did not differ from chance in the symbol-based system. In contrast, during retention testing the opposite pattern was observed. Children's receptive vocabulary scores did not differ from chance on the location-based system and children's receptive vocabulary scores were significantly above chance in the symbol-based system. The finding that children may have performed better on expressive than receptive testing suggests that there may be something inherently different about learning words on an AAC system that makes expressive language easier than receptive language.

In verbal language, receptive language typically develops more quickly than expressive language (Petursdottir & Carr, 2011). In verbal expressive language, an individual must assess a phonological form, formulate the motor pattern to produce the form, and then physically produce the form. On the contrary, expressive language on AAC systems requires pressing a button on the device. This difference in the sequence of expressing language in two different language modalities could play a part in facilitating expressive language on an AAC system. The fact that children were able to do well on symbol receptive testing of retention, but not as well in the receptive testing of symbols following the teaching suggests that changing the location of the symbol throughout the teaching (done to ensure they learn the symbol and not its location) may interfere with the immediate testing. Although it interferes with testing immediately after teaching, children retained some knowledge of the words as demonstrated by above chance performance on the receptive vocabulary retention scores on the symbol-based system. There may be a difference in the consolidation process in symbol versus location learning when transferring the novel words from short-term to long-term memory. Future research should investigate the consolidation processes in varying types of AAC systems, as well as looking at retention and how it differs across systems.

Limitations

A limitation of this study is its generalizability. Only 12 children were enrolled in this study, and future studies should include more participants. With this small sample size came a lack of available data. In studying preschoolers there is an extensive process of gaining permission from both the schools and the children’s parents. Therefore, this played the biggest role in the smaller sample size. Additionally, prior research on retention is limited, thus further development in this area of research is needed.

Conclusions:

My study found that preschool children are able to fast map words after a single teaching session. However, I found that vocabulary learning is not influenced by the type of AAC system. It was also discovered that expressive language on an AAC device may be easier than receptive language. Participants were most successful on the location-based system in immediate receptive testing and on the symbol-based system in the retention receptive testing.

References:

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