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Barriers to accessing augmentative and alternative communication (AAC): Pogo Boards as a potential solution

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BARRIERS TO ACCESSING AUGMENTATIVE AND ALTERNATIVE COMMUNICATION (AAC): POGO BOARDS AS A POTENTIAL SOLUTION

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Abstract

Communication is extremely important to our livelihood because it gives us an avenue to ensure our basic needs are met, create and foster growth of relationships, solve disputes, and learn from one another. As a result, most individuals find communication both satisfying and rewarding. However, for others communication can be a source of frustration, and may simply be impossible for some. When this is the case, certain types of technology, augmentative and alternative communication (AAC) can be used to assist an individual with their communication. Despite the many advantages of AAC, there are unique challenges associated with its use as well. This study sought to determine what those challenges were for individuals. The information discovered was then used to critically evaluate Pogo Boards, a locally-made example of AAC available, to determine if this method for communication could reduce some of the potential barriers associated with AAC.

Introduction

Importance of Communication

As humans, we constantly communicate and many of us may not even be aware of it. From infancy, most of us used a form of communication, crying, to satisfy our needs. As we grew older, we learned more efficient ways of communicating with others through gestures, words, and eventually entire sentences (Beukelman & Mirenda, 2013). We also learned to communicate more than just our temporary needs but also how to convey different emotions, thoughts, and ideas. We learned the turn-taking process that is so common in many communication settings **(**American Speech-Language-Hearing Association, 2013d; Trembath, Balandin, Stancliffe, & Togher, 2010**)**. Now there are so many different methods of communicating, from a knowing look shared with a friend to social media websites, that we also must learn how to use the technology available to facilitate this communication, a task much easier for some than others (DeRuyter, McNaughton, Caves, Nelson, & Williams, 2007).

Communication has allowed us to become the complex society we are today. Without communication we would not have been able to pass down information and knowledge from generation to generation. Communication is what keeps us linked to one another; it is how we are able to cooperate and designate specific roles for individuals **(**Trembath, et al., 2010**)**. Through effective communication we can create and strengthen relationships and prevent or resolve misunderstandings (Trembath, et al., 2010).

Communication Challenges

The freedom to express our needs, thoughts, feelings, and desires is so important that our country included it as a constitutional right through the First Amendment (Joint Commission, 2010; Light & McNaughton, 2012). However, citizens in other countries may not have access to

this same right. In fact, some of our very own citizens in the United States may not be able to fully take advantage of this constitutional amendment (Beukelman & Mirenda, 2013). For example, imagine that rather than it being illegal to communicate certain thoughts about a topic to another individual, it is simply not possible or extremely difficult to share these thoughts because one's body does not have the physical capabilities to do so. This is what those who live with communication disorders deal with on a daily basis.

Communication disorders can affect individuals in many ways. Those with such a diagnosis may have difficulty with verbal or nonverbal communication. They may also struggle with the ability to create and send messages or may have more difficulty comprehending the messages sent by others (American Speech-Language-Hearing Association, 1993). Due to the wide variety of ways a communication disorder can affect those who have them, and due to the personal nature of such a diagnosis, it is difficult to determine exactly how many individuals have a communication disorder.

However, it has been estimated that anywhere from two to forty million Americans have a communication disorder that affects their ability to interact with others on a daily basis (American Speech-Language-Hearing Association, 2013b; American Speech-Language-Hearing Association, 2013c). In alignment with this estimation, Beukelman & Mirenda (2013) believe that there are approximately four million people living in the United States who are not able to reliably communicate on a daily basis using natural speech. Additionally, both those who have communication disorders and those who work with individuals that struggle to communicate have expressed frustration regarding the difficulties of interaction (Mukhopadhyay & Nwaogu, 2009). Fortunately, those who have communication disorders have options to help improve their ability to connect with others.

AAC Options

One option that can be used to assist individuals is augmentative and alternative communication, or AAC. AAC includes any device or form of communication, other than natural speech, that an individual can use to convey or receive a message indicating anything from basic needs to opinions or abstract concepts (American Speech-Language-Hearing Association, 2013a). AAC is a relatively new field, having only gained recognition in the past forty years or so (Light & McNaughton, 2012). Because the use of AAC is only now becoming well-known, the research opportunities available within the topic are nearly endless.

Because AAC includes many different forms of communication, categories have been defined to help both the user and those assisting the user understand what AAC is and can do. The American Speech-Language-Hearing Association (2013a) has broken AAC into two main categories: aided and unaided. Unaided communication is any form of communication that can be done with the tools the user already has: his or her body. Examples of unaided communication include gestures, signs, or body language (American Speech-Language-Hearing Association, 2013a). Aided communication is any form of communication that requires the use of a tool or piece of equipment (American Speech-Language-Hearing Association, 2013a). For example, individuals can communicate with the use of a computer, other electronic devices, paper and pencil, or by pointing to pictures or words to convey their thoughts.

Types of aided communication are further broken into the categories of high tech (or those that require the use of batteries or electricity) and low tech (those that require neither batteries nor electricity) (United States Society for Augmentative and Alternative Communication, 2013). High tech devices have further been categorized as well to include those whose main function is communication and those who have other functions but have been

modified to serve as a communication device as well (United States Society for Augmentative and Alternative Communication, 2013). DeRuyter, et al. (2007) proposed that high tech devices can be organized into three categories: those that are specialized devices with AAC software solely for communicating, those that are specialized devices with AAC software but use mainstream operating systems, and those that are mainstream devices with AAC software and use a mainstream operating system. Clearly there are many different AAC options available for individuals who need assistance with communicating.

AAC Users

Just as there are many different types of AAC that can be used to help individuals communicate, the range of diagnoses of those who may need AAC is expansive. AAC has been shown to be an effective means of communication for populations of individuals with the following: cerebral palsy (American Speech-Language-Hearing Association, 2013c; Hustad & Miles, 2010), ALS (American Speech-Language-Hearing Association, 2013c; Light & McNaughton, 2012), autism spectrum disorders (Light & McNaughton, 2012), apraxia of speech (Beukelman & Mirenda, 2013), and stroke and other brain injuries (American Speech-Language-Hearing Association, 2013c; Talk To Me Technologies, 2013). Additionally, the need for AAC will continue to increase as medical advances allow more and more individuals with varying disabilities to survive (Light & McNaughton, 2012). While the aforementioned list is nowhere near complete or exhaustive, it does show that the individuals who would benefit from the use of AAC are at least as diverse and numerous as the options available for AAC users.

Additionally, Branson and Demchak (2009) summarized that all AAC users can be organized into three main categories: those who have difficulty expressing themselves in many situations, those who temporarily need AAC to understand others and express themselves or

those who can express themselves but sometimes are not understood by others, and those who permanently need AAC for help with both expressive and receptive communication. Because there are many different types of AAC available, these general categories become useful when beginning to determine which type of AAC may be most beneficial for an individual with a communication disorder. Once an individual's communication needs are determined, these needs can be matched with features of different AAC options or devices to increase the chances of an individual's success with AAC. However, not everyone who would benefit from the use of AAC has had the opportunity to use it.

While the use and acceptance of AAC has increased over recent years, there are still many individuals who are not receiving the assistance from AAC that might improve their ability to communicate (Hustad & Miles, 2010; Light & McNaughton, 2012). While it may be easy to believe that the individuals who are not receiving access to AAC are those who live in developing countries and elsewhere, the evidence shows that this issue is prevalent even in the United States. According to the Assistive Technology Law Center (2012), it is estimated that only 2-3% of those who need speech generating devices (AAC devices that have voice output) in the United States actually have such devices and the services associated with them available to them. When on average 11,000 of these devices are sold in the United States annually (Assistive Technology Law Center, 2012), and only 2-3% of the population with a need is being reached, this is a major cause for concern. In short, this data would suggest over 300,000 individuals yearly would specifically benefit from a speech generating device. Furthermore, when one examines this data, it becomes apparent that the data only encompasses a specific type of AAC, and as a result only one part of the entire population that could benefit from the use of AAC. This issue led to the first topic to be addressed, barriers to accessing AAC.

Pogo Boards

The second research question of this thesis investigates a particular AAC technology. Pogo Boards, the AAC technology that will be investigated in this study, is one of the many options AAC users have to choose from. The technology is high tech and available for use on the iPad, iPod, or iPhone as an app and can also be used on a computer (Talk To Me Technologies, 2013). Pogo Boards can be used to create communication boards, organized symbols or pictures that represent words, allowing individuals to communicate even if they are unable to use speech (Talk To Me Technologies, 2013). Individuals can choose to use pre-made communication boards available on the internet and accessible on either a PC or Mac computer, or new boards can be made using the almost limitless pictures and symbols available (Talk To Me Technologies, 2013). Once the boards are made on a computer, they can either be used on the same device or sent to an iPad, iPod, or iPhone (Talk To Me Technologies, 2013). Pogo Boards was chosen as a specific type of AAC for further research because the technology is very new; therefore only a limited amount of literature exists on the technology (Talk To Me Technologies, 2013). Pogo Boards was also created by Talk To Me Technologies, a company based out of Cedar Falls, Iowa, making additional access to the technology and its creators possible.

Research Questions

1. Why are those who could benefit from the use of AAC not taking advantage of this technology?

The second part of this thesis synthesizes the information found from the first research question with additional research to answer:

2. Could Pogo Boards resolve some of the barriers to AAC access? What barriers to AAC access does Pogo Boards address? What sets Pogo Boards apart from other currently available AAC technologies?

Methodology

In order to answer the research questions, a literature review was conducted to determine what barriers or factors are limiting the use of AAC for individuals that would benefit from such technology. When determining what sources will be applicable to the research question, the following strategies were employed. First and foremost, searches for literature were limited to peer-reviewed sources whenever possible. Terms used to search for literature answering the first research question included: “barriers to AAC use”, “prevalence of AAC use”, “reasons for AAC abandonment” and “factors affecting AAC use”. A meta-analysis of the findings from the literature sources was then used to guide the how the second research question was approached.

To answer the second research question, a review of the available literature regarding Pogo Boards was conducted using the search term “Pogo Boards.” Interviews of those involved with the creation of Pogo Boards and of those who are knowledgeable in the area of AAC, and what the needs of AAC users are, were conducted to give the author additional background information. Finally, the author’s personal experience with the technology Pogo Boards was used to help determine the scope and effectiveness of the product. The information gained from

all of the above listed sources was then synthesized with the barrier information from the first research question to address the second portion of the research project.

Results and Discussion

Barriers to Accessing AAC

The resources found to help determine barriers to AAC use had two main ways of approaching the issue. The first set of articles examined at reasons why those who might benefit from AAC use are not using AAC. The second set of articles investigated why those who have tried AAC ultimately abandoned it. Reasons from both sets of articles were then combined with the similar information simplified into one reason with multiple sources. The number of resources that offered insight to the barriers to AAC use were numerous. As a result, while this study encompasses many of the possible reasons why an individual may not seek AAC or may not continue to use AAC, it is also very likely that situations arise that are not addressed in this study. Additionally, the majority of resources investigated focused on high-tech AAC, therefore many possible barriers specific to more low-tech AAC options may not be present in this study. Low-tech AAC option barriers and specific individual barriers were both outside the scope of this study.

Once a final list of barriers was determined, the barriers were further analyzed to be categorized into groups. Main categories were determined with the help from an AAC expert and review of the previous literature. The following were the final categories of areas in which AAC barriers are prevalent: beliefs, misconceptions, and support issues, professional training and services, device limitations, and opportunities for use. Additionally, many of these categories were further broken down into sub-categories to be later discussed. While a discussion of the major categories and subcategories will follow, each individual barrier found

will not necessarily be addressed and explained. A complete list of all determined barriers can be found in the following graphics: Misconceptions, beliefs, and support issues-Table 1, Professional training and services-Table 2, and Device limitations-Table 3 and Opportunities for use-Table 4 (see below).

Misconceptions, Beliefs and Support Issues.

The first set of barriers to discuss are those related to beliefs and misconceptions regarding AAC and those who might be potential users of such technology. These ideas were further organized into three categories: family, community, and professional. However, the barriers related to AAC in these categories often fit under more than one of these headings. These categories were simply used to show the scope of the beliefs and misconceptions. Additionally, it should be emphasized that while these statements are generalizations, in no way do they encompass the beliefs of all members of a certain group, but rather serve as possible beliefs that have been shown to be barriers to AAC. For example, it is certain that not all professionals hold the misconception about AAC that it could limit the ability to learn speech (Light & Drager, 2007; Light & McNaughton, 2012). However, this is also a legitimate reason that some professionals may not use AAC even when it would be a viable option for their clients. A complete listing of all barriers in the category of Misconceptions, beliefs and support issues can be found below in Table 1.

Looking at the possible barriers in this first category more carefully, it becomes clear that our perception and attitude toward AAC can have a large impact on those who use AAC, regardless if they are our clients, family members or friends, or simply a part of our community. There are many reasons as to why individuals may not be supportive of AAC. Some of these reasons include false beliefs (Branson & Demchak, 2009; Light & Drager, 2007; Light &

McNaughton, 2012), as addressed in the barriers, and lack of knowledge. Additionally, those who are aware of AAC may not be caught up with all the recent advances in the field as this technology is continually changing and improving. This may lead individuals to feel that AAC still has many shortcomings in comparison to typical speech due to their previous exposure to AAC.

When looking at families of those who use AAC services, one must be aware of the impact the news that the individual will use AAC can have on the family. Many families are devastated when they learn that a loved one may not have the ability to communicate typically, whether just temporary or long-term. When these emotions are coupled with a lack of knowledge about AAC, families may find themselves in despair. Additionally, once an AAC system has been put in place, families may still feel pressure regarding use of the system or lack confidence to use the system depending on the support provided to them (Saito & Turnbull, 2007). As families consider the future of their loved ones, they may be concerned of how the individual will fit in with their peers, what kind of job outlook there will be for this individual, and what types of opportunities they will have in the future. However, families must also keep in mind that AAC may be able to give their loved one a voice they would not have had without it.

Because AAC is still an up and coming area of treatment for those that struggle with communication, the community is also largely unaware of the possibilities available with AAC. Even professionals recognize a lack of and need for more research and training in the area of AAC, making it quite understandable that the general public may not be as informed when it comes to AAC when compared to other devices that aid others like hearing aids or wheelchairs. Because of the lack of exposure to AAC, many individuals in the community may simply not

know how to react when first introduced to individuals that use such technology (Baxter, Enderby, Evans, & Judge, 2012; Light & McNaughton, 2012; Mukhopadhyay & Nwaogu, 2009; Saito & Turnbull, 2007). However as everyday technology continues to become more accessible to everyone, hopefully this attitude will begin to change. We have already seen the beginnings of increased awareness with individuals who are AAC users sharing their stories to the world.

For professionals such as speech-language pathologists, many often feel they do not receive enough training in the area of AAC which will be addressed more in-depth in a subsequent section (Beukelman & Mirenda, 2013; Light & McNaughton, 2012; Trembath et al., 2010). While individuals that use or may be recommended to use AAC often receive services from speech-language pathologists, these professionals may not often have clients on their caseload that are AAC users. Rates of clients that are also AAC users may vary even more depending on the setting the speech-language pathologist works in (American Speech-Language-Hearing Association, 2002). This means that when a professional is assigned a new client on their caseload that uses AAC they may need to do a significant amount of research in order to stay up-to-date with the field. Additionally, because there are many different AAC devices and programs used, even professionals who specialize in AAC may find themselves unfamiliar with the technology a new client is using.

Table 1

Misconceptions, Beliefs, Support Issues	FAMILY	COMMUNITY	PROFESSIONAL
Previously believed that AAC would limit young children learning speech or speech recovery; some may still hold this belief and as a result avoid use of AAC (Light & McNaughton, 2012; Light & Drager, 2007)	X		X
Previously believed that certain prerequisites were required for successful use of AAC, we now know it can be used even with infants, but some may still hold this misconception (Light &McNaughton, 2012)			X
Waiting to start AAC with young children in hopes that speech will come soon instead of beginning AAC as soon as issues become apparent (Branson & Demchak, 2009)	X		X
Poor attitude toward technology, concerns of social stigma (Baxter, Enderby, Evans, & Judge**,** 2012; Light & McNaughton, 2012; Mukhopadhyay & Nwaogu, 2009; Saito & Turnbull, 2007)	X	X	X
Lack of support (Mukhopadhyay & Nwaogu, 2009; Johnson, Inglebret, Jones, & Ray, 2006; Lund & Light, 2006)	X	X	
Increased responsibilities, time, and stress on parent (Saito & Turnbull, 2007)	X		
Limited knowledge, skills, and confidence with technology (Baxter, et al., 2012)	X		X
Lack of community acceptance and opportunities for community involvement (Saito & Turnbull, 2007)		X	

* "X" denotes each social category in which the communication barrier is present. This table was organized differently than the others due to the overlap of barriers.

Professional Training and Services.

Considering the challenges professionals may face with AAC leads into the next major category that are addressed in the barriers of AAC use: Professional Training and Services. This category is divided into three subcategories: accessibility to services, limitations of the services provided, and user and communication partner training. Accessibility to services specifically targets reasons why an individual seeking services related to AAC may not be able to access these services. Limitation of the services provided addresses areas in which services could be improved. User and partner communication training is separated from general limitations of the services provided due to the large number of reasons specifically related to training individuals in how to facilitate conversation using the device. A complete list of barriers within each category can be found in Table 2.

Accessibility to services.

When taking a closer look at the first subcategory, accessibility to services, it is clear that overall the need for services is much greater than what is currently available to AAC users and their families (Beukelman & Mirenda, 2013; Light & McNaughton, 2012; Trembath et al., 2010). Additionally, for those who have found available services, a significant amount of travel or time away from the device may be required (Baxter et al., 2012). For example, if a device malfunctions, depending on the issue, it may need to be sent back to the manufacturer for repair. Depending on where the device was made, what kind of repairs need to be done, and other factors, an individual may be without his or her device for a significant amount of time.

Furthermore, as discussed above, many of the professionals who are providing services to AAC users feel they have not been adequately trained to provide the best services possible for these clients. This can be a major source of frustration for professionals, users, and their families

alike as all are trying to learn how best to navigate the communication system at the same time (Beukelman & Mirenda, 2013; Light & McNaughton, 2012; Trembath et al., 2010). However, when handled correctly, having a client with an unfamiliar AAC device can prove to be a great learning opportunity for the professional, user, and family if all parties are open with communication about expectations and willing to have patience.

Limitations of services provided.

The next subcategory within the professional training aspect of barriers to accessing AAC is limitations of services provided. This category takes a closer look at the services that are provided and where more or different intervention may still be needed to optimize the services being provided to AAC users. This category encompasses many different ideas, from the importance of considering an AAC user's culture and family preferences (Saito & Turnbull, 2007), to determining how vocabulary will be updated for the user (Trembath et al., 2010), to structuring therapy activities to promote the skills that are being worked on to carry over into everyday life situations (Baxter et al., 2012).

Professionals need to consider future use for their clients when working with AAC. However, the literature has shown that not all professionals are planning for their client's future use (Saito & Turnbull, 2007). Keeping future use in mind will help ensure the client has access to proper vocabulary and the current system used will not impede future use. For example, if a professional is beginning use of a high tech AAC device with a client, they will need to consider what the client may need anywhere from six months to a few years later, because a client typically has a system for at least a few years. When working with young children, this will be even more critical as a typically developing child's vocabulary grows exponentially in their early years (Branson & Demchak, 2009). Additionally, when professionals work in a team, much like

an IEP team would be used in a school setting, users are more likely to have all their needs met and be satisfied with the services they receive. Meeting a user's needs and providing satisfying services will eliminate several barriers to AAC access.

User and Communication Partner Training.

The third subcategory of professional training and services is user and communication partner training. This category is most specific to the types of services a speech-language pathologist might provide in comparison to other professionals that might also work with AAC users. Across sources, several users expressed frustration with feeling that they had not received adequate training to successfully use the AAC system (Medeiros & Cress, 2010; Trembath et al., 2010). Additionally, many communication partners, such as family members, friends, or employers, felt they did not receive enough training on how to use the device or promote usage of the device (Medeiros & Cress, 2010).

According to the research (Baxter et al., 2012), some specific areas in which training needed improvement include beginning communication with new communication partners and how to work through communication breakdowns. Communication breakdowns are the times when a message is misunderstood by the communication partner, or also in the case of AAC perhaps the adequate vocabulary is not available. These breakdowns in communication are a cause of frustration for both users and communication partners and if they occur often enough, may lead to abandonment of an AAC device. However, with practice both communication partners and AAC users can learn strategies to help work through these challenges. With increased professional training in relation to AAC, many of the shortcomings of services provided, including user and communication partner training, should be addressed improving the ability of AAC users to engage in an everyday practice, communicating with others.

Table 2

PROFESSIONAL TRAINING/SERVICES						
ACCESSIBILITY TO SERVICES	Inadequate professional training and knowledge about AAC to provide best services (Light & McNaughton, 2012; Trembath et al., 2010; Beukelman & Mirenda, 2013)	Lack of support professionals and services available (Mukhopadhyay & Nwaogu, 2009; Johnson, et al., 2006)	Lack of local AAC services (Baxter et al., 2012)	Limited technological support (Baxter et al., 2012)		
LIMITATIONS OF SERVICES PROVIDED	Lack of collaboration between professionals (Baxter et al., 2012; Beukelman & Mirenda, 2013)	Professional insensitivity to cultural and familial preferences (Saito & Turnbull, 2007)	Lack of planning ahead for future use (Saito & Turnbull, 2007)	Lack of system updates as needs change (Johnson et al., 2006)	Lack of vocab or vocab updates (Trembath et al, 2010)	Skills learned in therapy may not be generalized to everyday usage (Baxter et al., 2012)
USER/COMM. PARTNER TRAINING	Insufficient training for users (Trembath et al., 2010)	Communication partners not able to understand the device (Johnson et al., 2006)	Parents/other comm. partners lack training in how to respond to the device to promote usage (Medeiros & Cress, 2010)	Unclear family expectations place stress on family and user (Bailey, Parette, Stoner, Angell, & Carroll , 2006)	Lack of ways to introduce device to new comm. partners (Baxter et al., 2012)	Lack of ways to deal with communication breakdowns (Baxter et al., 2012)

Device Limitations.

The third category of barriers to AAC use to address is device limitations. A complete list of barriers related to device limitations can be found in Table 3. A few specific barriers as well as the subcategories of device limitations including general limitations, device access limitations, and voice output limitations will be addressed below.

General.

Within the category of device limitations there is a group of general limitations as well as limitations more specifically related to physical characteristics of the device and voice output. General device limitations are addressed in this section. While technology has made many improvements over the years that have led to better and better AAC devices, users still find that there are some areas in which the technology could be improved. For instance, many AAC users also make use of other technologies, such as cell phones, and not all AAC devices are compatible with these other technologies at this time (DeRuyter et al., 2006; Light & McNaughton, 2012). Furthermore, another issue within the general category of device limitations is the need for backup equipment when a device breaks down and the amount of time an AAC device spent in repair (Bailey et al., 2006; Baxter et al., 2012; Saito & Turnbull, 2007). However, one "barrier" to AAC use that may not actually truly be a barrier but was included in this category is the situation in which an AAC user uses another method of communication other than his or her device because the other method is easier (Bailey et al., 2006). This does not mean that the AAC device is difficult to use by any means, but just shows that we prefer to communicate in the quickest and least energy-expending way possible.

Device Access Limitations.

Additionally, the device limitations category also has a subcategory specifically addressing device accessibility in relation to its physical characteristics. These include characteristics such as the physical size, weight of the device, and the inability to easily mount or transport with the user (Bailey et al., 2006; Baxter et al., 2012; Trembath et al., 2010). Additionally, high tech devices are simply not appropriate for use in certain settings, such as those with significant water hazards, for the obvious reason that electricity and water do not mix (Bailey et al., 2006; Harris, 2007). While this does not mean we should discontinue the use of high tech devices simply because they are not available for use in all settings, it does mean that we have to plan ahead and provide alternate forms of communication for these settings.

Voice Output Limitations.

A third subcategory of device limitations is also present and focuses solely on the voice output limitations of devices with such capabilities. While not all AAC users may use voice output, many do. As several individuals felt that voice output could be improved, this is an area of AAC that could present a significant barrier to someone using AAC if they were dissatisfied with the capabilities of their device. Some users felt that the quality of speech output was lacking in general (Creer, Cunningham, Green, & Yamagishi, 2013; Bailey et al., 2006; Trembath et al., 2006). Others found it frustrating that many voice output devices are not yet compatible to use with languages other than English or integrating multiple languages (Baxter et al., 2012).

With non-English languages, and with some English words as well, mispronunciation of words can be a major problem for users causing their own frustration and that of other communication partners who may struggle to understand them (Baxter et al., 2012). Another

challenge of voice output devices is that some users suffer embarrassment using a voice that is not their own (Baxter et al., 2012). While technology has made it possible to use one's own voice and integrate it into AAC technology in some situations, this is not possible for all AAC users. This means that voice options that suit the user are extremely important. Characteristics of voice to be considered include: user gender, age, and regional dialect. If an individual cannot find a voice to fit them and becomes frustrated enough with the mispronunciation of words, these are considered barriers to AAC access and may result in abandonment of the device.

Table 3

DEVICE LIMITATIONS						
General	Many AAC devices do not easily integrate with other current technology, (ex. cell phones) making it difficult for users to use device and other technology already in place (Light & McNaughton, 2012; DeRuyter et al, 2007)	Device programming too complex for user (Bailey et al., 2006)	Need for backup equipment, and services (Baxter et al., 2012)	Device breakdown, too unpredictable, too much time in repair (Saito & Turnbull, 2007; Bailey et al., 2006; Baxter et al., 2012)	Device not needed for some communication situations, non-symbolic communication easier (Bailey, et al., 2006)	Frustration with length of time needed to compose message (Baxter et al., 2012)
Device Access Limitations	Many of life's activities do not easily lend themselves to using a high tech AAC device due to necessity of keeping the device clean and dry: bathroom, showering, swimming, gardening, etc. (Harris, 2007; Bailey et al., 2006)	Limited accessibility due to physical characteristics of device, mounting issues, etc. (Trembath, et al., 2010)	Inadequate availability of services related to mounting or portability of device (Bailey et al., 2006; Trembath, et al., 2010)	Device too big/heavy for young users (Baxter et al., 2012)	Physical impairment of potential user (Baxter et al., 2012)	
Voice Output Limitations	Poor quality speech output; lack of appropriate speech output (Trembath et al, 2010; Bailey et al., 2006; Creer, Cunningham, Green, & Yamagishi, 2013)	User embarrassment when voice output was not their own (Baxter et al., 2012)	Frustration with mispronunciation of words (Baxter et al., 2012)	Voice limitations for those who speak languages other than English or multiple languages (Baxter et al., 2012)	Device output limitations with too much background noise (Baxter et al., 2012)	

Opportunities for Use.

A final category to consider with barriers to AAC access is opportunities for use. Opportunities for use encompassed many situations in which the ability to use AAC to communicate may have been limited. For example, a student user may have an AAC device that they use while in a resource room, but not in the mainstream classroom. Or perhaps a student has access to their device in the classroom, but only when at their desk and not during floor time or recess (Bailey et al., 2006; DeThorne & Hengst, 2010). Whenever an individual is unable to have access to their communication device they miss potential opportunities to engage in communication with others (Johnson et al., 2006). Additionally, users may be offered several opportunities to use the device but may not have as many opportunities to use the device independently (Kangas, 2007). Others may avoid using their device because of a stigma associated with it, or because they feel less confident with the device. One way to help deter a stigma and increase confidence of using the device is to model use of the device (Kangas, 2007). If professionals and communication partners are willing to model use of the device with the user, all will become more familiar with the device.

Table 4

OPPORTUNITIES FOR USE
Limited access to device while in class/opportunities available to communicate (Bailey et al., 2006; Mellman, DeThorne, & Hengst, 2010)
Not enough opportunities to use the system (Johnson et al., 2006)
Lack of modeling, seeing others use the device (Kangas, 2007)
Lack of activities to promote independent use of device (Kangas, 2007)
Lack of/limited funding (Trembath, et al., 2010)

One additional barrier related to opportunities of use and accessing AAC is funding. While funding for many devices is provided through insurance, insurance can have certain stipulations or limitations to what will be covered (Trembath et al., 2010). For instance, devices that are deemed to solely be used for communication purposes can be covered, while if another

individual wished to use a computer for communication, the computer may not be fully covered, or the individual may have to pay part of expenses in order to have access to anything other than the specific application used for communication. Furthermore, some users may wish or need to have more than one communication system in place, either for different settings or as an alternate to another as high tech options occasionally malfunction. All of these variables can add costs to families who may very likely already have their fair share of medical expenses. Furthermore, funding is an important issue in the United States and other countries as well when an individual seeks to use AAC (Mukhopadhyay & Nwaogu, 2009; Trembath et al., 2010).

Insights to Barriers

When further dissecting the barriers of AAC use, it became clear that while the categories used were helpful in organizing the information, many of the barriers could have been placed in more than one category. Furthermore, barriers placed in one category can affect other categories as well. For example, if AAC system is used that an individual and their family members has difficulty navigating or does not understand how to program, the family is less likely to participate in modeling and using the AAC system and the user may feel that they are not receiving enough support (Johnson, Inglebret, Jones, & Ray, 2006; Lund & Light, 2006; Medeiros & Cress, 2010; Mukhopadhyay & Nwaogu, 2009).

The realization that the barriers to AAC access in different categories can also be closely related also brings up an important second point. Despite how well a device is equipped for a specific individual's needs, if the individual does not receive adequate services and support from others, it is highly likely that the individual will not become a successful AAC user. The part that professionals play in providing services and preparing both users and their families and communication partners is vital to successful AAC adoption (Beukelman & Mirenda, 2013;

Light & McNaughton, 2012; Trembath et al., 2010). Additionally, the role that families and other communication partners play in an AAC user's exploration and use of different communication methods should not be forgotten. A communication partner that is willing to be patient with an AAC user can help reduce their frustration with the device and can model how to use the device, both giving the AAC user extra practice with the device and putting the device in a positive light (Medeiros & Cress, 2010). That being said, there still are many important features of a device to consider when choosing an AAC device for an individual who would benefit from AAC, which leads into the second portion of the discussion at hand.

Pogo Boards

The second portion of this study looks specifically at the AAC technology Pogo Boards and compares the application to the barriers identified previously to determine if Pogo Boards could reduce or eliminate any of these barriers for potential AAC users. Because Pogo Boards is a relatively new technology, limited sources of information were available on the application. However, a trial period during which the application was used helped to determine what barriers to AAC may be successfully addressed by Pogo Boards.

Pogo Boards and Misconceptions

The first major area of barriers were misconceptions, beliefs and support issues. While Pogo Boards certainly does not address some of the misconceptions held by others directly, it may serve to help reduce stigma and poor attitude toward AAC technology because the application runs on iPods and iPads (Talk To Me Technologies, 2013), which are becoming quite common technology in today's world. Pogo Boards users can access their communication boards from computers, iPods, and iPads eliminating the need for specialized equipment or technology to be able to communicate. Especially for younger users, options that use

mainstream devices, such as Pogo Boards, may be a good choice as they allow students to feel they fit in with other students and the technologies they may also have access to. Additionally, a mainstream device such as the iPod or iPad allows users access to other technologies such as the internet or music, which may provide users with additional conversation topics with peers.

Pogo Boards and Professional Services

Looking at the next category of barriers, professional training and services, while a type of AAC is unlikely to completely change the services offered by a professional, Pogo Boards does offer some benefits to professionals. Taking advantage of such benefits may help professionals to become more effective as they can spend less time concerned with the technology aspect of helping individuals who are AAC users and spend more time working on what types of situations and therapy will be most effective in helping teach their clients how to become effective communicators using AAC (Talk To Me Technologies, 2013). One benefit for users and professionals in the area is the fact that Pogo Boards is a locally-based technology. Additionally, Talk To Me Technologies (2013), the company that created the application Pogo Boards offers contact information online, allowing any user the opportunity to ask a question or for assistance and receive a timely response.

Another benefit of the application Pogo Boards is that users are able to share their boards with others. Boards can be shared using Pogo Boards' website and application, or can be emailed as a pdf format (Talk To Me Technologies, 2013). While the pdf format wouldn't allow the receiver access to voice output, etc. a pdf version of the board would make a suitable low tech communication option, or a good backup choice in case of technology malfunction (Talk To Me Technologies, 2013). Not only can boards be shared with others, this allows users access to premade boards and activities using Pogo Boards. This can save professionals, users, and their

families a great deal of time as they do not need to re-create the most basic boards. Additionally, any pre-made board can be adjusted to fit the specific needs of the user and saved to the user's account for future use (Talk To Me Technologies, 2013).

Along with the possibility to access already created boards in the future, any boards, the user's or those who are public and available to anyone, can also be accessed anywhere that an individual has internet access. Because this service is internet-based, this eliminates the need to remember multiple discs, like many symbol systems use (Talk To Me Technologies, 2013). Furthermore, the cost to have access to the number of symbol systems that Pogo Boards allows users access to is significantly lower than if these symbol systems had been separately purchased. This idea will be addressed in further detail below.

Pogo Boards and Device Limitations

When considering the category of device limitations, including device access limitations and voice output, Pogo Boards addresses several of the potential barriers investigated. For example, because Pogo Boards is used on devices such as computers, iPods, and iPads, this AAC technology may integrate more easily with current technologies that AAC users find just as important as the general public, such as cellphones and internet. For example, devices like the iPad now have apps that can be downloaded for texting. Additionally, creating communication boards with Pogo Boards is very intuitive and can be done with minimal training. For those who would like a little more training before beginning, Talk To Me Technologies offers tutorials on their Pogo Boards website (Talk To Me Technologies, 2013).

When looking at the subcategory of device access limitations, it becomes clear that the use of Pogo Boards in conjunction with an iPod/iPad/iPhone may have some important benefits for AAC users. For users who are able to manually select, this technology combination provides

a very lightweight and portable option, with iPads weighing around a pound and iPods even less (Apple Inc, 2014). This is comparable with some of the other lightest devices designed for AAC use, and may be considerably lighter than others (DynaVox, 2014; Saltillo Corporation, 2014).

Additionally, Pogo Boards does not operate on iPod/iPad exclusively. The application can also be used to create boards for other communication devices as well. When a communication device is purchased for a user, the device itself has the capabilities for communication but often does not have a vocabulary set from which to choose from. These must often be purchased along with the physical device (Mayer-Johnson, 2014). When one chooses a vocabulary set, they are often choosing from a specific set of symbols available from one company. Pogo Boards has access to many symbol systems including: PiCS (Color and Black and White), SymbolStix, Mulberry Symbols, AbleNet Symbols, any of your own images, and any images that can be found using an integrated Google search (Talk To Me Technologies, 2013).

Furthermore, one great advantage of Pogo Boards in comparison to other symbol systems offered is the fact that multiple symbol systems can be combined when using Pogo Boards for no additional cost. Many other symbol systems, such as Boardmaker, release the equivalent to expansion packs for vocabulary (Mayer-Johnson, 2014). These addendums often come at extra cost. For example, addendums for Boardmaker cost between as little as fifteen dollars for small sets and hundreds of dollars for larger bundled sets (Mayer-Johnson, 2014). Pogo Boards, on the other hand, does not charge for any additional symbols and vocabulary that are made available on the application and allows users even more options with an integrated Google search for images at no additional cost (Talk To Me Technologies, 2013).

One area that AAC users express a great deal of frustration in is the voice output ability of a communication device. Pogo Boards offers users over 40 voices to choose from, in a variety of languages and dialects (Talk To Me Technologies, 2013). For example, there are options for a child speaker, several English choices including U.S. English and UK English, many Spanish choices, and even some fun options like the ability to whisper or shout (Talk To Me Technologies, 2013). Additionally, Pogo Boards gives users the option to record sounds or speech and input it directly into the board (Talk To Me Technologies, 2013). This feature would allow users and professionals to recognize words that are mispronounced early on and make their own recordings of these words, hopefully preventing some of the frustration associated with voice output.

Because Pogo Boards has access to so many symbol systems, it is also a good option for ELL (English Language Learner) students and other individuals working on learning a second language, or for those with AAC needs that speak one language at home and a second at school (Talk To Me Technologies, 2013). While not every language spoken in the world is offered through Pogo Boards, voices for many of the more commonly used languages are available including: English, Spanish, Portuguese, French, and German among many others (Talk To Me Technologies, 2013). Additionally, as text is so easy to add to symbols in Pogo Boards, having words in both languages that the user knows is also a possibility.

Pogo Boards and Opportunities for Use

A final benefit of Pogo Boards is the affordability of the communication option. AAC devices can cost several thousands of dollars (DynaVox, 2014; Saltillo Corporation, 2014). While these devices can often be obtained through funding of Medicaid, Medicare and other insurance, sometimes individuals have difficulty proving need (Talk To Me Technologies, 2013).

Additionally, an individual must pay extra in order to have other functions on such devices, like internet, and this will not be covered by insurance (DynaVox, 2014). While the cost of an iPad would likely not be currently covered by insurance, or at least not in full, it is a much more affordable option for some individuals who may have trouble proving need, or like schools, who may wish to use the technology for multiple students (Talk To Me Technologies, 2013). Furthermore, many individuals may already have the technology needed to use the Pogo Boards application in their home or place of work. Additionally, while there is a fee for access to Pogo Boards services, the cost per user goes down with the number of users and years subscribed to. For instance, a user will have full access to all Pogo Boards has to offer for a month for less than ten dollars (Talk To Me Technologies, 2013). Additionally, if the user purchased a subscription for a year the cost would be just under seventy dollars (see Figure 1 below for more information).

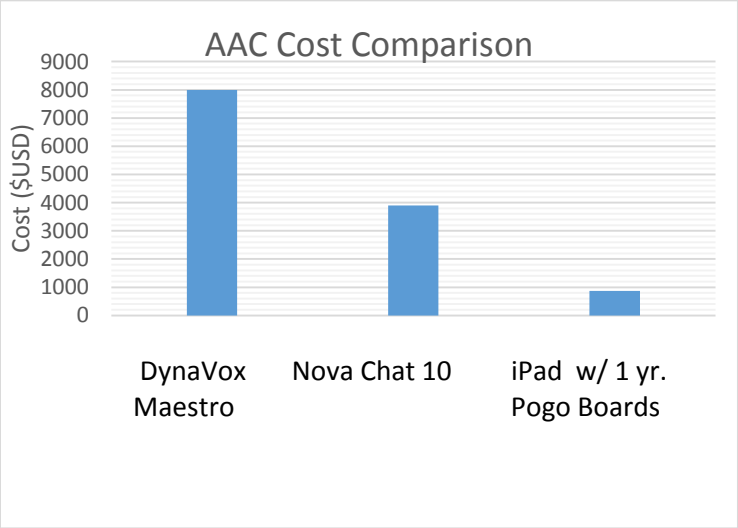
Figure 1

# of Users	1 Month (per user)	1 YEAR (per user)	2 YEARS (per user)	3 YEARS (per user)
1-4	9.95	$69.00	$99.00	$129.00
5-10	⊠	$49.00	$79.00	$99.00
11-25	⊠	$39.00	$59.00	$75.00
26-50	⊠	$29.00	$49.00	$65.00
51-75	⊠	$27.00	$45.00	$61.00
76-100	⊠	$25.00	$42.00	$59.00
101-150	⊠	$23.00	$39.00	$55.00
151-200	⊠	$21.00	$37.00	$51.00
201+	⊠	$19.00	$35.00	$49.00

(Talk To Me Technologies, 2014)

Furthermore, a comparison of two similar AAC devices, the DynaVox Maestro (Dynavox, 2014) and the Nova Chat 10 (Saltillo Corporation, 2014) clearly showed the cost advantage of Pogo Boards over specialized communication devices with similar features. The results are illustrated below (see Figure 2 below). Depending on the AAC user's needs the chart may be accurate or the cost of Pogo Boards could be lower or higher based on how long the user would need the device. A one year subscription was chosen as a midpoint because individuals who may need a device for the typical lifespan of a device (about five years) might be more likely to choose a specialized AAC device due to extended service availability and other characteristics. While devices typically last a user up to five years, four more years of Pogo Boards would only cost the user approximately $200 more, making Pogo Boards and an iPad much more affordable than other options (around $1000 compared to $4000-$8000), especially for users having difficulty with insurance companies covering a device.

Figure 2



(DynaVox, 2014; Saltillo Corporation, 2014; Talk To Me Technologies, 2013)

Conclusion and Future Research

While many of us may take the ability to communicate for granted, many others do not find communication so simple. For individuals who have difficulty communicating orally, there are many AAC options available. These options can range from low to high tech and can use many different types of technology. However, despite the many advances technology has made in recent years, there are still factors inhibiting individuals who would benefit from the use of AAC from taking full advantage of these communication systems. These many barriers can be organized into four main categories: Misconceptions, beliefs, and support issues, Professional services and training issues, Device limitations, and limitations of Opportunities for use.

Pogo Boards, a locally-based technology created by Talk To Me Technologies, was further investigated to determine if the application would decrease or eliminate any of the reported barriers to AAC use. Pogo Boards has been shown to address some of the barriers related to the limitations of AAC use. It has several unique characteristics, such as the ability to easily access one's own materials and those that others have created that make it a good option to consider for someone who needs help communicating. Additionally, the low cost makes it a good option for those who may need just temporary assistance, or for those who may be looking for something to go along with another system already in place, or even to be used in school systems that may have many students who would benefit from the boards and activities that could be made using Pogo Boards.

However, just because Pogo Boards is considered a good option for potential AAC users, it will not address the needs of all AAC users. Professionals helping individuals who need alternative ways to communicate need to recognize that there will be no single technology solution for all of their clients. Each client is an individual and has individual needs to be

considered. For individuals who need assistance that is lightweight, prefer a voice output option, would benefit from symbols or pictures to help them communicate, and are capable of manually selecting Pogo Boards may be an option that should be considered. A free two-week trial can help determine if Pogo Boards could give the individual with AAC needs the voice they have been waiting for.

Because AAC is a relatively new field, there is an immense need for additional research in almost all areas. Additionally, further research that investigates Pogo Boards, allowing user trials by individuals who would benefit from AAC use is suggested to further recognize the benefits of this application. A study allowing professionals to test the application in comparison to some of the other symbol and communication systems they might be more familiar with would be beneficial to determine areas in which Pogo Boards excels and where improvements have yet to be made. As more research and information becomes available about AAC, professionals should become more knowledgeable in the area. As professional knowledge increases and more individuals begin to use AAC that would benefit from such technology, the hope is that the public will become better informed as well.

Making AAC better known to the public would help prevent some of the misconceptions about AAC and the lack of support for this viable mode of communication. Such a change would have an incredible impact on AAC users as we have seen how support of family, friends, and other communication partners play such an important role in the success of AAC use. As technological advances seem to occur almost daily in our present age, the future of AAC is bright and the possibilities for the future of those who may need extra assistance to effectively communicate are endless.

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