Augmentative and Alternative Communication Devices and Their Effectiveness as Elements of Early Intervention

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Introduction

Autism spectrum disorders (ASD) is a developmental disability. People who are diagnosed with ASD have problems with social communication, experience difficulties with interpersonal interactions, and have repetitive behaviors and interest (American Psychiatric Association, 2013). Children who are diagnosed with ASD exhibit deficits across multiple environments. These difficulties manifest as deficits in conversations, in social interaction, and in relationships (American Psychiatric Association, 2013), and they may arise from both verbal and nonverbal miscues. As a function of the combination of deficits, the educational performance of students may be attenuated.

Approximately 1 in 100 children are diagnosed with ASD. Children who are diagnosed with ASD exhibit deficits in social interaction and communication across multiple environments. Weakness in pragmatic language skills are common, and this may exacerbate problems with

social interaction and relationships. (American Psychiatric Association, 2013). Other behavioral and cognitive symptoms of ASD include repetitive activities and stereotyped movements, resistance to changes (environmental or daily routines) and unusual responses to sensory experiences. (American Psychiatric Association, 2013)

Statement of the Problem

This paper examines the effects of early language intervention using augmentative and alternative communication (AAC) technologies affect the social and academic language of students diagnosed with Autism Spectrum Disorders (ASD) who are also nonverbal. The primary emphasis is performance during elementary school, but the review is not fully delimited to pupils and students of this age.

Two questions guide the analysis. First, do early intervention programs using AAC devices attenuate the academic and social language deficits of students with ASD who are also nonverbal? Second, do such skills generalize or are the effects limit to the contexts and the environments where training using the technologies occurred? I hypothesize that students who have an ASD and nonverbal and receive training using AAC technologies will be better able to communicate their thoughts and feelings better than their matched peers who are not exposed to an AAC as an element of early intervention.

Overview of the Constructs in the Review

Two principal constructs are examined in this review: Autism Spectrum Disorders (ASD) and augmentative and alternative communication (AAC). In this section, these constructs are introduced.

Autism Spectrum Disorders (ASD) and Verbal Ability

Because Autism is a spectrum disorder, levels of communication can vary from person to person. At the lower end of functioning, children with ASD may be nonverbal. To be identified as nonverbal, an individual must convey information without the use of words and oral language. Communication may happen through use of facial expressions, gestures, body language and other physical indications (American Psychological Association, 2022).   Communication needs should be addressed as soon as a child is diagnosed with ASD.

Augmentative and Alternative Communication Technologies

Augmentative and alternative communication (AAC) devices are different tools and strategies that can be used to communicate a person's thoughts (Burkhart, 2011). AAC is any tool or technology that helps develop or enhance communication skills (Cafiero & Meyer, 2008). Devices that may be used can be aided or unaided. The technologies may be as simple as pictures that a person points to or hands to others; they can also be more complex. High tech forms of AAC include speech generation devices, tablet computers, computer applications, and technologies.   The use of an AAC device helps develop speech in children who may not be able to communicate verbally. Speech and language pathologists usually assist with the training that goes into using an AAC device in the classroom and other places. The goal for an individual to have an AAC device is usually to be able to communicate independently and state their needs and wants (Burkart, 2011). Since people with ASD have very diverse communication needs and levels of language ability, devices should also be individualized to fit those needs. Some may do best with devices of varied technological sophistication depending on their levels.

Many different types of AAC devices are extant. One distinction is whether the device may be used unaided or if the device requires aid or assistance. Unaided devices do not require a physical aid or tool. These could include gestures, sign language, or body language. Aided AAC

requires tools or materials. This would consist of symbol boards, communication books, or a speech generated device. All of these devices require that the user receives training on the operation of the technology. Children may not like a device or have trouble with certain types. Assessment of an individual's ability is formative, and in addition to the ability to operate the device, assessments should include the user's needs, the environments in which the devise will be used, and the ease of operation for a specific individual. Children will have a speech language pathologist and usually a special education teacher to help them with their AAC devices.

User-device Interactions in the Context of ASD

Students with Autism Spectrum Disorder who are also nonverbal need a way to communicate their thoughts and feelings. Augmentative and alternative communication (AAC) devices are promulgated as a means for achieving this goal. Each student is unique and has different needs. A speech-language pathologist will work with students and families to trial different communication programs to see what works best for them.

Practical Considerations in this Review: My Experiences

Students in my classroom who use an AAC device need many prompts to understand how to communicate using the device. All of the students in my classroom who use an AAC device have a speech generated device. They have an application on a tablet that is monitored by the speech language pathologist. The applications are individualized depending on the students' needs and abilities. When we talk about the weather, they need to be prompted 2-3 times to go to the weather page on their speech generated device. The conversations are not happening naturally and very rarely does a student find the word that they need to push for their academics without prompts and modeling. I am in a middle school classroom; if my students had received

their devices at a younger age, would they be better able to communicate using their device?

Would they need less prompting to complete a conversation with another person?

I have students with varying abilities on their device. Even my students with a high ability with their devices are still not using the devices unless prompted. When I greet a student, they will usually wave at me first unless prompted to use their device before my greeting. Some of students prefer using devices, and others prefer using sign language or spoken language. Ability levels in my classroom range from students who are fully dependent on adult assistance with their AAC devices to students that can navigate their AAC devices and find the words they are looking for. Some of the students will type their answers to questions or type what they see on the lessons. While these students are incredibly savvy on their AAC devices, they do not use the in a natural way. Teaching core words for students to use with their AAC device can be beneficial, but this training does not always transfer to other. Students are using devices when prompted and not immediately reaching for them. Even when students are nonverbal they are using gestures, sign language, or other nonverbal communications with their bodies before reaching for the AAC device. If we start students out at an earlier age, will it become more natural for them to want to communicate using their device instead?

The availability of training and of technologies is another variable in implementation. School districts may not have speech language pathologists who are proficient in AAC devices. This may cause a delay in students getting AAC devices at a younger age. Students also need to qualify for districts to start them with a communication device. This can cause a delay in services because they are not getting fully diagnosed at a young age.

Chapter II: Review of Literature

This review examines the use of alternative and augmentative communication (AAC) as elements of an early intervention strategy for individuals with individuals who have Autism Spectrum Disorders (ASD). A specific focus is on individuals who are nonverbal, but the review is not solely delimited to this population. In Chapter I, alternative and augmentative description was described, and Autism Spectrum Disorders were defined both operationally and theoretically. In addition, the use of AAC devices and strategies with individuals who are diagnosed with ASD are promulgated as the foci for the review. In Chapter II, research addressing the use of AAC as an intervention for the academic and social deficits as an epiphenomena of ASD that appears in the literature of education and of psychology is reviewed. In Chapter III, the findings from the analysis are summarized, and the implications of these findings will be described.

Scope of the Review

The literature on augmentative and alternative communication is extensive. Thus, for purposes of this review, searches were delimited to articles published between 2000-2022. Studies examining AAC appear in the literature of education, of psychology, of rehabilitation, and of medicine. Because the purpose of this review involved enhancing educational practice, articles appearing in the ERIC database were the primary focus. Because of the number of studies addressing AAC, search terms and descriptors were often combined to yield a manageable set of studies.

The scope of the review is to look at the effectiveness of augmentative and alternative communication with children and to see how the devices effectiveness might contribute to students natural conversations when they are older. The articles cover studies that were done

with groups of students with autism spectrum disorders and their use of an AAC device. The

ages vary but mainly look at students that are preschool and young elementary ages. All of the

children that were looked at in the study have a developmental disability, with the most common

diagnosis being autism spectrum disorder.

Presentation of Studies

In this section, the individual studies are presented. The principal findings of each study

are summarized. When present, design flaws and delimitations are identified.

Nam, Kim, and Sparks (2018)

The authors reviewed of five studies addressing the efficacy of AAC devices

for people with autism and other developmental disabilities. The goal for the review was to

identify trends in the research across twenty-five years. A number of significant findings

emerged from their analysis.

According to the National Research Council, 33% to 50% of individuals with ASD do

not use speech functionally. Thus, these individuals must use other ways to communicate.

Representative modalities include crying, eye gazes or other nonverbal actions. The authors

suggests that it is a priority to provide AAC devices to children. The AAC devices are used to

enhance communication for individuals that are not able to communicate effectively on their

own. While each person shows unique needs in their communication, AAC devices can help

bridge the gap. Different types of AAC devices that are mentioned in the article that may be

effective are manual signs, picture exchanges system, and speech generating devices.

The authors also compared and contrasted the different types of AAC devices to evaluate

their efficacy. The studies showed inconsistent results, and a universal approach for which AAC

device is best for individuals with developmental disabilities could not be determined. People with

disabilities are all individuals, and the study showed that while each individual had the same communication need, they all needed different communication devices to help them be successful.

The authors also reviewed the advantages and disadvantages of AAC devices for individuals with communication needs because of their developmental disability. Speech is the most common type of communication, but AAC options can be used when speech is not the primary mode of communication. Different systems can be beneficial to students, and also, a combination of systems depending on individual needs may be employed. The different AAC devices examined in the study are non-electronic which includes manual signs, low-tech eye gaze, gestures, facial expression, picture exchange and writing texts and electronic versions include high-tech eye gaze, speech generating devices and typing texts.

While the effectiveness of the different AAC devices have given inconsistent results for outcomes, this may be a function of the diverse needs of individuals. Each student has skills that may affect how a communication device is implemented and used. Students should be able to select what type of AAC device they would prefer to use for their own communication needs.

Hampton, Kaiser, & Fuller (2020)

Most children with ASD have not begun talking by age of three (3) tears, and 33% of the population will remain without being able to communicate verbally past the age of five (5) years. This study shows how spoken language outcomes are greater when there are multiple different people giving language interventions to the child. During this study, 68 children between the ages of three and five years who were diagnosed with ASD participated in the study. The children received a speech-generating AAC device and individualized training with their caregiver. The authors were specifically investigating multi-component interventions may improve social communication in children.

The students were randomly assigned to groups. In both groups, students were given an IPad with Proloquo2Go application for communication. The caregivers were given training on the programming and the use of the application. Children in the intervention group were given three targeted interventions per week during the study. No significant differences were extant between the groups. The control group of the study showed significant improvement in initiated joint attention and improved caregiver strategies. This study shows that the inclusion of an AAC device in student learning does not develop spoken language, but it does show the fact that introducing an AAC device before the age of 8 years can improve other modes of communication.

If children receive interventions for communication before the age of 8 years, they will demonstrate better communication skills. They need multiple interventions which include working with the caregivers and students in multiple sessions per week. In the future research, a longitudinal study would be beneficial to see how the students grow on their skills with their AAC devices.

Murray (2014)

The author investigated means for improving the communication of children with ASD. Picture Exchange Communication System (PECS) were compared and contrasted with the use of a speech generated device like an Apple IPad.

PECS is a picture based system. This system is geared towards having the child learn how to communicate in a social environment (Murray, 2014) Students may develop better communication skills and even verbal communication after using the PECS system. It is a system that is easy to use, and it does not require a lot of training. The system is portable and very low cost. The picture cards can become worn and need to be replaced often. When a child is

using a PECS communication system and trying to carry on a conversation with another person, they need to know how to apply the system. This can cause some frustration for the child to not be able to easily communicate with others if they are not trained in the system.

Using an Apple iPad as a speech generating device is another way to use an AAC device with a child with limited communication. While these devices have been proven to be very effective with students, effective use of the device requires extensive practice and training. Murray (2014) reports that students have had higher rates of independence with requesting when using a speech generating device compared to a PECS. Among speech generating devices, the Apple iPad usually takes less training for students to be able to master. The Apple iPad's can also be more customizable to meet individual needs without having to prepare more pictures.

The speech generating devices are also more socially acceptable. People are accustomed to seeing children carrying around Apple iPad's or cell phones. Unlike the PECS, there is no training required for another person to communicate with someone using an Apple iPad to communicate. The iPad's or tablets are becoming more and more cost friendly and can be affordable by many. They usually last a long time and can help students communicate more effectively in different settings. While both PECS and speech generating devices are effective in their own ways, it would depend on the children's individual preferences and needs to see which system would work best for them.

Dorney and Erickson (2020)

The authors wanted to determine if preschool students with ASD could gain communication skills from interventions that focused on attributing communicative meaning to student behaviors, provided aided language input, and focusing on graphic symbols to represent core vocabulary (Dorney & Erickson, 2020). Thirteen children between the ages of three to five

years participated in the study. Analyses focused on the children's communication skills and how their teachers taught them the skills they needed to succeed. Many unconventional forms of communication were extant; these modalities included sounds, grabbing for objects, and maladaptive behaviors like screaming or throwing themselves on the floor.

One way the adults showed the students how to effectively communicate was through aided language input. This system has the adults pair the symbols used with spoken words. They show the students the symbol and then speak the word that goes with the students. If the student is trying to grab for something, the adult would point at the symbol for the object and verbally say what it is. This can be a range from single words to complex sets.

Students also learned core vocabulary. Core vocabulary are words that are used in face-to-face conversations most often. These are words that students may need to know to be able to communicate effectively with others.

Teachers were trained in different professional developmental sessions. The teachers were licensed and taught within the three different preschool classrooms. They also had training on the Picture Exchange Communication System (PECS). The PECS system was implemented in the classrooms and the students were given an "aided language board" which had different symbols for core vocabulary and colors. The PECS system was encouraged at meal times, where the language board was encouraged throughout the day.

Teachers were observed giving aided language input to students to match their own speech then to help the students find the words for things that they wanted to communicate at the beginning of the school year. The authors report that once teachers received more training sessions they became more versed in how to help the students communicate their own needs. Students then become more likely to connect the symbols to communication and look for them

when they wanted to communicate. This decreased during certain times of the day when the symbols were not as easily accessible to the students. The symbols were not being used to engage socially, and were mainly being used to state needs and wants, mainly at mealtimes. Students made overall gains in their communication throughout this study. The teachers also increased their knowledge of using the picture systems to help students communicate more effectively, even though they did miss many opportunities to increase the students natural conversation skills.

The goal of using the AAC systems in the preschool class was to help the students express whatever they wanted, to whomever they wanted, whenever they wanted (Dorney & Erickson, 2020) If the students are continually working on increasing their communication skills through the use of AAC systems, their communication will continually get better as they get older.

Overall this study shows that preschool students can communicate when given instruction with core vocabulary and graphic symbols through the use of aided language input. This is dependent on the teachers' willingness to learn and develop the skills necessary to teach students how to communicate in this way effectively. It also depends on the students individual needs and if the picture systems work for them.

Meeks (2017)

Meeks wanted to determine if the use of a speech generated device increased requesting skills in students with autism spectrum disorders. Two preschool students participated in the study. Both were given interventions and taught how to use an AAC device to communicate their requests. This was mainly done at meal times and in settings to which they were accustomed. Both of the students' communication with requests increased over the study.

The students were taught the first three phases of the Picture Exchange Communication System. The first three phases include the following: making requests, persistence in initiating communication and discrimination between symbols (Meeks, 2017). A single subject design was used for the study. This helped with allowing students to be their own control group and to give the study more of a baseline with the small group.

The act of requesting an item is an important communication skill, especially in preschool or in early elementary grades. The students were asked what they wanted to eat for their snack, and they were given an Apple iPad with the Go Talk Now communication application to select their food. After practice with the device, the students began seeking out the iPad to make requests for food. Both students also showed increased communication behaviors whether through speech or via AAC devices.

Talkington, McLaughlin, Derby, and Clark (2013)

The researchers evaluated the effectiveness of AAC devices for preschool aged students who have a developmental delay like ASD. Creating opportunities for students to use augmentative communication devices can be beneficial for their communication and success in the classroom. Teaching AAC devices to young children has been suggested to be an important teaching tool because they can increase choice-making opportunities (Talkington et al., 2013). Using a single participant design, the authors examined how the a five-year-old student requested attention and asked for assistance.

The student was trained on using the Flip 'n Talk AAC device via modeling in response to authentic communication needs in the classroom. The student began to request assistance after the intervention. The use of the AAC device increased the student's skills in asking for help and attention. His social interactions with peers increased with the AAC device also.es The

researchers also noted that the participant gained skills even with a gap in services because of issues outside of their control.

This study shows the benefits of adding an AAC device for communication with a young student. The student had drastically improved their communication after adding the device into their routine.

Andzik, Chung, and Kranak (2016)

Students with communication needs are now more likely to be receive language services via AAC systems. Having students use natural conversations with peers is an important part of the school environment. Few studies that have investigated social interactions of students with developmental disabilities in a natural environment (Andzik et al., 2016). The interactions of students in this study with others were observed. About 80% of these observations were adult initiated. They were not happening naturally.

Twenty-three student between the ages of six to eleven years participated in the study. All of the students had a disability, and all of them used an AAC device. The students used speech generated devices, one to two single message devices, and picture cues. The researchers were looking for spontaneous communication that was not prompted by an adult in the room. According to the results, nineteen communication events occurred for each student per hour, but about 90% of those were opportunities presented for students to respond. With only 10% being spontaneous communication. Most of these communications were done in the special education classroom. Even when students had a speech generated device. they only had access to it for 63% of times. Students were observed in special education settings and general education settings for approximately five hours.

Students who have communications needs must develop an effective way to communicate with others. They need appropriate access to their AAC devices and opportunities to communicate with many different people throughout their day. Students were also not given opportunities to use their devices or they were not able to answer the questions that were asked of them. While the students all had different abilities, strength and needs their interactions with others were mostly partner dominated (Andzik et al., 2016). This pattern is common for students who use AAC devices.

Adults and peers can be trained to appropriately initiate and keep a conversation with someone who is using an AAC system. It is also important to make sure students always have access to their device, which means it being charged and taking it with to every class.

The elementary students who were part of this study showed the need for structured supports from the special education team to make sure they were using their communication skills to the best of their abilities. Having highly qualified teachers and staff is important to make sure the communication system is used effectively.

Nunes (2008)

The author reviewed 56 peer reviewed studies published between 1980-2007. They considered types of strategies, experimental designs, language intervention goals, setting and intervention agents, and participant characteristics. All of the studies in the review studied individuals with ASD who used an AAC device.

Different AAC strategies were examined; the approaches included total communication/sign language, gestures, symbols, speech generating devices, and hybrid models. Sign language has been a part of alternative communication from the 1970s until today. The results have varied on whether sign language is an effective way of communication for children

who have developmental disabilities. With mixed reviews, sign language is best when used in natural settings.

Visual-graphic symbols include pictograms and photos. This is important because it is easier for students with developmental disabilities to use recognition rather than recall memory (Nunes, 2008). Visual-graphic symbols help students understand the flow of a conversation when having to check with what the other person is saying to them and answering with the pictograms. The studies show that students with ASD respond to pictures better than speech or sign language. (Nunes, 2008)

Picture communication has been proven to work well with students with ASD. The Picture Exchange System (PECS) has been an effective strategy on many different levels. PECS has shown to improve vocal/verbal imitation, the frequency of imitations, responses and comments and decreasing problem behaviors. (Nunes, 2008) PECS can be effective with students who have higher cognitive abilities and not beneficial to others.

Speech generating devices are increasing in popularity and show a positive influence in receptive and expressive communication (Nunes, 2008). Since the publication of this study in 2008, speech generating devices have vastly increased in availability and ease of use.

AAC interventions are assets for individuals with ASD. Children developed language skills that they did not already possess. There is no direct study of AAC interventions comparing to each other, but because the topic is so individualized, it would be difficult to measure that anyways. AAC has only improved from the 1970s, and it is continually getting better for future children and families to use.

Biggs, Carter, Bumble, Barnes, and Mazur (2018)

The authors were interested in determining whether AAC devices facilitate communication between individuals who have developmental disabilities and their peers who do not have a disability. The specific goal was to increase "…peer interaction for students with complex communication needs and investigating whether embedding peer implemented aided AAC modeling within the intervention would increase student's use of symbolic communication." Although AAC devices help people with developmental disabilities communicate, the group often lack peer interaction and may experience social isolation. Students with developmental disabilities will usually only communicate with their teachers and their paraprofessionals.

To help students learn to interact with their peers, the authors designed peer network interventions. Peer network interventions have three core features: establishing repeated interaction opportunities during shared social activities, providing adult facilitation, and equipping peers to be effective communication partners. (Biggs et al., 2018) Having students help model using an AAC device can be helpful to make connections with spoken words, symbols and their meanings. (Biggs et al., 2018) Students in grades three through five were selected to participate in the study. To participate in the study, the students needed to be learning how to use an AAC device and to be receiving special education services. The authors found that peer instruction on the AAC device increased the level of peer interaction for most of the participants.

Adding peer instruction and interaction to a student's day increased their communication with peers because they felt more comfortable. This can help students use their AAC devices in a more natural way for conversations with peers. This is a good way to make sure students with

disabilities are included with their mainstream peers and work on their communication skills at the same time.

Chapter III: Summary and Implications

This review examines the use of alternative and augmentative communication (AAC) as elements of an early intervention strategy for individuals with individuals who have Autism Spectrum Disorders (ASD). A specific focus is on individuals who are nonverbal, but the review is not solely delimited to this population. In Chapter I, alternative and augmentative description is described, and Autism Spectrum Disorders were defined both operationally and theoretically. In addition, the use of AAC devices and strategies with individuals who are diagnosed with ASD are promulgated as the foci for the review. In Chapter II, research addressing the use of AAC as an intervention for the academic and social deficits as an epiphenomena of ASD that appears in the literature of education and of psychology was reviewed. In Chapter III, the findings from the analysis are summarized, and the implications of these findings are described.

Summary

Myriad findings emerged from this review. First, the preponderance of the authors has concluded that direct instruction at a young age can contribute to better communication skills for students with developmental disabilities and that AAC devices can further improve their communication abilities. Second, many different types of AAC devices that can be used depending on the students' individual needs for communication. Communication is an important part of everyday life for students and having access to that at a young age can vastly increase a person's quality of life. Third, many of the studies showed that students did well with the AAC interventions to help them build upon their communication skills. Speech generating devices seemed to be of higher interest than PECS or a picture communication system. This pattern may result from children's interest in technology. Many different strategies for having students use an AAC device in a school setting are extant. Everything in special education is based upon the

individual student's needs, and augmentative and alternative communication systems are not different.

The studies tended to be single subject design. This can cause issues in validity because there is not as much data to compare to. For this subject it makes sense that there is not a huge sample of students, unless a large geographical area is covered. The studies usually had only a handful of people in them unless they were combining and comparing multiple different studies.

Implications

AAC is effective in helping students communicate their needs. Even when students were not explicitly taught how to use their devices, they still caught on to using them and had an increase in communication with others. They need to be taught on how to use the system effectively and then build upon their prior knowledge to increase their communication skills. A speech language pathologist and special education staff should be leading the student to use the device when they can and become more natural with it.

While there are no specific longitudinal studies on the effects of having an AAC device in younger elementary and how it effects communication as the student gets older, the research suggests that this would be the case if students were continuing on with their AAC interventions. We can assume that the upward trend that the studies show for preschoolers who are introduced to AAC throughout the year that it would continue to grow as they become older and they mature. Students may want to be more socially interactive as they get older also and that would cause growth in their communication skills.

Augmentative and alternative communication devices are beneficial to children who are diagnosed with a developmental disability like autism spectrum disorders. This gives students the opportunity to communicate with adults and peers and be included in all activities, inside and

outside the classroom. AAC devices should continue to be used in the classroom setting to increase students' communication. This will help teachers understand what students are trying to say. It also gives students more independence in their lives because they are able to communicate their needs for others to hear. AAC devices will continue to be popular, with speech generated devices becoming more popular as technology expands.

Further research is needed on the subject of AAC devices. Most studies are single subject design studies, and this can be expanded to larger sample sizes. This will increase the data collected and improve the generalizability of the studies. Future research could also include a longitudinal study that follows students that start with an AAC device in early childhood and continues on through adulthood.

Augmentative and alternative communication for children with disabilities is increasing, and it has shifted significantly in the last twenty years. AAC will continue to grow and expand as technology does and hopefully someday each student will start with an AAC device at a young age and have communication skills that match their ability level.

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