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A Study of Factors that Influence Symbol Selection on Augmentative and Alternative Communication Devices for Individuals with Autism Spectrum Disorder

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An Abstract of a Dissertation Submitted to Nova Southeastern University in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

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by
William Todd Dauterman
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According to the American Academy of Pediatrics (AAP), 1 in 59 children are diagnosed with Autism Spectrum Disorder (ASD) each year. Given the complexity of ASD and how it is manifested in individuals, the execution of proper interventions is difficult. One major area of concern is how individuals with ASD who have limited communication skills are taught to communicate using Augmentative and Alternative Communication devices (AAC). AACs are portable electronic devices that facilitate communication by using audibles, signs, gestures, and picture symbols. Traditionally, Speech Language Pathologists (SLPs) are the primary facilitators of AAC devices and help establish the language individuals with ASD use. The study focused on SLP's decisions involving the selection of picture symbols or icons on AAC devices to assist with communication needs of individuals with ASD. Previous research suggested that individuals with ASD are more successful users of AAC devices when the symbols selected reflect the subject more closely and have meaning to the individual.

The main research question that guided the study was, “What factors are considered by SLPs when selecting icons on AAC devices?” Interpretative Phenomenological Analysis (IPA) was applied as a qualitative inquiry method to learn about SLPs experiences of working with individuals diagnosed with ASD, with emphasis on experiences with symbol selection on AAC devices. The results of the study provided deep insight into main factors that influence symbol selections and challenges SLPs have in making selections of icons on AAC devices. Multiple factors influenced symbol selections with three primary themes: device designers, training, and usability. As a result of the factors identified, recommendations were established to help SLPs and other facilitators who work with designing page sets for AAC devices that function specifically to meet the needs of individuals with ASD. Recommendations for future research should further investigate the issues uncovered in this study that focus on factors that influence the selection of symbols used on AAC devices, including exploring the use of symbols across multiple devices used by the individual diagnosed with ASD and the transferability of symbols within the community and other environments.

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Chapter 1

Introduction

Background

Autism Spectrum Disorder (ASD) is a complex neurological disability that is manifested in a multitude of ways, but many of the symptoms are treatable with early intervention. The American Academy of Pediatrics (AAP, 2020) defines ASD as a neurodevelopmental disorder with core deficits identified in two domains: social communication/interaction and restrictive, and repetitive patterns of behavior with the current prevalence rate of children diagnosed with ASD is 1 in 59 children. The challenging aspect of ASD is that it manifests so differently in individuals and entails a multitude of symptoms, which are often complicated by other disabilities. The level of this manifestation determines where on the spectrum the individual falls and dictates the type of treatment they will require (AAP, 2020). The most complicated symptom of ASD is the impairment of communication and the ability to articulate thoughts and ideas to others across a variety of platforms.

Autism Spectrum Disorder is defined by the National Institute of Neurological Disorders and Strokes (NIDS), which states that ASD is the most common condition of neurological disorders in the ASD group. It is a disorder characterized by the following traits (NIDS, 2019):

1. Persistent deficits in social communication and social interaction across multiple contexts.
2. Problems with verbal and non-verbal communication.
3. Restricted, repetitive patterns of behavior, interests, or activities.
4. Obsessive interest.
5. Symptoms cause clinically significant impairment in social interactions occupational, or other important areas of current functioning.

The Diagnostic and Statistical Manual of Mental Disorders (DSM) classifies ASD under three main categories: Autistic Disorder, PDD-NOS, and Childhood Disintegrative Disorder with a more detailed explanation of the symptoms. Individuals are also categorized based on the severity of their diagnosis and the type of support they require in their daily lives. These individuals are categorized as a level 3 and require the most support due to their severe lack of skills and inability to communicate (APA, 2016).

Augmentative and Alternative Communication (AAC) Devices

The introduction of Augmentative and Alternative Communication (AAC) devices has offered individuals in the autistic community a means to be interactive in society and, in some cases, to be self-sufficient. AAC devices are portable electronic devices that provide an audible speech-based system. An AAC device is a tool that helps facilitate communication by using signs, gestures, picture symbols, and speech-generating devices for individuals who struggle with speech (Douglas & Gerde, 2019). The primary source of the pictures used is the Picture Exchange Communication System

(PECS), which is developed to facilitate communication with non-verbal individuals (Bondy & Frost, 1994). PECS requires the user to exchange a picture card with a communication partner to obtain an item. As users become more advanced in PECS, they expand their vocabulary and communication skills, which allows them in turn to engage in conversations with others (Bondy & Frost, 1994).

For individuals diagnosed with autism, the use of pictures becomes the primary method by which speech therapists and teachers communicate through visual schedules and social stories to relay pertinent information. As the development of PECS and other communication systems has evolved over the years, the variation in pictures used and designed, symbols, and icons have shown to complicate the ability of individuals with autism to express themselves to others (Bondy & Frost, 1994; Hayes, Hirano, Marcu, Monibi, Nguyen, & Yeganyan, 2010; Kunda & Goel, 2008). Belani (2012) stated that this variation creates challenges in the development of AAC devices. He contended that the ease of use of AAC devices should be simple enough for the user to be able to accommodate their communication needs.

In many situations, individuals use a mixture of communication systems that range from picture cards attached to a board to speech generating devices (McCoy, Demasco, Pennington, & Badman, 1997). The pictures do not always reflect the meaning of the word it represents or lacks any form of iconicity. Pampoulou (2017) stated that with over 20 symbol sets available for usage by SLPs, the selection was overwhelming. Pampoulou asserts that it is the role of the SLP to evaluate the user's ability to recognize

the symbol and its referent, as well as to explore their needs, skills, and preferences when it comes to the symbol. For individuals who struggle to process information and articulate their thoughts, ensuring that the symbol or icon used relates to the object it intends to represent is imperative for the advancement of communication skills and an improved quality of life (Bruce, Trief, & Cascella, 2011).

Temple Grandin is a well-known individual who was diagnosed with autism as an adult but struggled as a child with communication and expressing her thoughts and ideas. She was able to earn a college degree and become a veterinarian despite her challenges. Grandin has used her platform to help others understand the way some individuals diagnosed with autism think by sharing how she visualizes her words and thoughts, calling it "thinking in pictures" (Grandin, 2006). Grandin compares her thinking to a computer program where she takes small parts of many things and makes new images. She further states that as her "video library" grows, she can create more images.

Grandin shared that she has no language-based memory; everything is picture-based. This way of thinking she attributes to the Treatment and Education of Autistic and related Communications Handicapped Children (TEACCH) program that was founded on the use of visual methods (Grandin, 2006; Kunda & Goel, 2011). She shared a memory of visiting a classroom in Iceland and how she was able to recall the Icelandic word for computer (tolva) by visualizing the classroom and where the computer was located. The iconicity of the object made it possible for her to recall the information. The TEACCH program is defined as a set of procedures and activities that are organized in the child's

environment, either home or school, that develops the visual perception skills of individuals diagnosed with autism. The overall intent of the program is to help individuals obtain what they need in life to be successful by improving their visual perception of objects presented to them (Warford & Kunda, 2018; Hamad & Ahmed, 2020).

Kunda and Goel (2008) expanded on research conducted by Paivio (1991) that utilized the dual-coding theory to define how an individual with ASD thinks in pictures. The dual-coding theory identified two key components: content and encoding. Content refers to the type of knowledge is being presented and encoding refers to how that knowledge is represented. Aryanto (2020) stated that when a person uses the duel-coding theory they process information using two systems for memory: mental images and verbal representation. For typically developing individuals, concrete concepts are easily represented verbally or visually, and abstract concepts are usually verbally represented since there is often no visual image to accompany the word (for example: there). Some individuals diagnosed with autism are visual thinkers, while others think in patterns; however, when a thinker struggles to recall words using one concept or the other, they often try to retrieve information using other methods. The more imagery the thinker has for a word, the more success they will have when recalling and understanding the concept (Aryanto, 2020). These factors must be at the forefront of any decision-making process used by an SLP.

Hartley and Allen (2013) investigated the differences between the use of pictures of a typically developed child (TDC) and a child with autism (CWA) use of pictures to comprehend information. They stated that CWAs may view certain pictures as signs due to learning that leads to them receiving something. Therefore, they found behavior can be impacted due to how a CWA interpreted a picture. The findings of Hartley and Allen suggested that CWAs appeared to derive information from pictures differently than TDCs based on what the icon or symbol represented.

Hartley, Trainer, and Allen (2019) continued their research to discover that children with minimum verbal skills diagnosed with ASD have an atypical understanding of pictures. Hartley et al. (2019) stated that in typically developing children, their comprehension and production of language changes as their use of language becomes more effective. However, for a child diagnosed with ASD, Hartley et al. (2019) hypothesized that a deficit in these two symbolic domains may exist, making it more difficult for individuals with ASD to comprehend and produce expressive language.

Every developer of AAC devices has designed their own symbol language used as the symbol set for communication. Speech Language Pathologists (SLPs) often utilize the programmed language on the device when setting it up for communication and for determining which symbols are to be used by individuals with ASD. Pampoulou (2017) studied the influences that impacted the selection of symbols by SLPs and found that iconicity influenced the selection of symbols, along with the choices offered by the software installed and by a student's choice.

Pampoulou (2017) stated that due to a lack of research on symbol selection, SLPs were not using evidence-based practices to select symbols for users. Instead, SLPs used their own professional judgment and experiences to select symbols. Pampoulou stressed the importance of training for SLPs to make them more aware of symbol sets available for use and the importance of iconicity when selecting a symbol for use on an AAC device.

Pampoulou (2019) worked to define graphic symbols, understanding that the term can have various meanings to different people, which can be a source of confusion for the facilitators of AAC devices and their decision-making processes, especially for individuals with compound communication needs. Pampoulou (2019) encouraged future research to explore factors that impacted the decision of SLPs when it comes to selecting symbols used on AAC devices.

Usability and AAC Devices

Cisnero, and Juarez-Ramirez, Mejia-Figueroa (2016) and Mejia-Figueroa and Juarez-Ramirez (2013) established the need to improve the usability of user-centered software design for individuals with autism. Mejia-Figueroa and Juarez-Ramirez (2013) explained the nature of the disorder and variances across the spectrum of users that made the adoption of universally usable device difficult. Mejia-Figueroa and Juarez-Ramirez (2013) asserted that design must be considered within the context of ASD along with the associated traits of the disorder to improve overall usability.

Wobbrock, Kane, Gajos, Harada, and Froehlich (2011) developed the principles of an ability-based design for users with disabilities as an alternative to the one size fits all approach to usability. Wobbrock et al. described a necessity for a flexible, adaptive system design that conforms to the user's abilities versus an individual's need to conform to the system. They stated the central element in the user-based design is the need to consider the requirement of the individual's abilities.

Light and McNaughton (2012) described that the design of AAC devices were for individuals with speech delays or brain injury patients, excluding individuals with cognitive impairment. Light and McNaughton (2012) described the widespread access to AAC devices along with the successful outcome led to the adoption of the devices across all disabilities. Hayes et al. (2010) explained that for individuals on the ASD spectrum, teachers created customized classroom curriculums, but most of the AAC devices did not provide the same flexibility needed for customization. Hayes et al. stated the device's visual supports must be personalized and adapted to the individual user.

Pampoulou and Fuller (2020) extended research started by Pampoulou (2019) on the study of graphic symbols used on AAC devices. Pampoulou (2019) stressed the importance of utilizing consistent terminology in the field that would develop standardized terms and characteristics for the sake of the user. Pampoulou and Fuller (2020) began to explore the factors that impacted SLPs decision making on AAC devices by examining their choices. They found that complexity, segmentation, vocabulary size, and iconicity were important when selecting symbols, but with the constant changes to

symbol sets and more knowledge known about how different disabilities interact with AAC devices, more research is needed to fully understand how best to select symbols.

Gibson, Dunlap, Bouamrane, and Nayar (2020) conducted research on the usability of AAC devices with individuals diagnosed with an intellectual disability (ID). Gibson et al. (2020) defined ID as having a significant reduction in understanding new information and knowing how to apply those skills. The implications of having these impaired functions result in the individual having a reduced ability to cope independently and requiring lifelong care. Gibson et al. (2020) expressed that while some individuals diagnosed as ID are able to function with some independence, the use of an AAC device would help in the support of their everyday needs, especially with vocabulary and language skills. However, a critical discovery by Gibson et al. (2020) was the lack of guidelines for developers to use to assist in creating technologies for individuals identified as ID or other specific diagnosis that require the use of an AAC device.

Problem Statement and Goal

Hartley and Allen (2013) stated that there are no standard guidelines for the selection of icons and symbols on AAC devices for individuals with ASD. Pampoulou (2017) stated that the lack of standard guidelines presents a challenge for SLPs to choose symbols for use on AAC devices, and SLPs often rely on their own knowledge and experience instead of using evidence-based best practices. Continuing the work of Hartley and Allen (2014), Pampoulou (2019), and Pampoulou and Fuller (2020), the addressable problem of this study was to examine how and why SLPs choose the symbols

and pictures displayed on AAC devices for users, specifically those diagnosed with ASD. The goal of the research was to identify the factors that influence symbol selection and develop recommendations for SLPs for when they implement an AAC device for individuals with ASD.

Research Question

The research question guiding the study was:

> What factors are considered by SLPs when selecting icons on AAC devices? Pampoulou and Fuller (2020) expressed the need for more research to better understand how symbols are selected for AAC devices by SLPs for a specific population.

The study examined how SLPs selected symbols on AAC devices for individuals with disabilities. SLPs were interviewed to determine what factors influenced symbol selection. Multiple components of how SLPs select symbols were examined, including SLPs' processes for choices, AAC device, icon design aspects, and the common symbols of iconic design that also differ across visual languages. Themes were generated from the interview responses and coded to derive what factors were considered for the selection of symbol. The results showed insights into factors that SLPs should consider when selecting symbol sets for individuals diagnosed with ASD.

Rationale and Need for This Study

Stance of the Researcher

Hartley and Allen (2013) presented in their research the important implications of a picture-based communication intervention system for individuals with autism and their ability to communicate with others. At the time of their published study, Hartley and Allen stated that no data-driven guidelines existed, but there is a need for guidelines to help SLPs determine what type of pictures were used on AAC devices when designing them for use with an individual with autism.

Pampoulou, Theodorou, and Petinou (2018) studied the views of SLPs towards AAC devices with complex communication needs and the benefit these devices provided for individuals diagnosed with acquired communication disorders. Specifically, Pampoulou explored how well these devices were accepted by the users and what factors lead to either their acceptance or rejection/abandonment of the AAC device. Pampoulou discussed the need to conduct future research to study more in-depth what may inhibit AAC acceptance such as technological limitations, SLP training, usability, and facilitators.

This researcher has had some personal experience working with individuals with autism who also utilized an AAC device to communicate. Throughout this experience, he has observed many different types of symbols used to represent the same word, which led him to question the symbol selection choices made by the SLPs and the pages used. Given the widespread adoption of this tool for communication purposes, the researcher

developed an interest in creating guidelines that were transferable to the "real world" and assist in the selection of symbols. While he does not have a formal background or training in speech language pathology or in the designing of AAC device pages, he has a background in advanced system interfaces, information technology and system engineering. In addition, the researcher has a firm understanding of constructs of usability, ease of use, and the importance of transferability between interfaces. Based on published research found on AAC devices and on personal experience, these factors motivated the researcher to explore this research problem and to develop guidelines for SLPs that will improve the use of AAC devices for individuals with autism.

Relevance and Significance

AAC devices were developed for people with varying disabilities as generalized tools that utilized multiple symbol sets to assist with communication. These symbol sets combined with online resources provided an unlimited library of icon choices for SLPs to select when setting up a new device (Ganz & Simpson, 2004). SLPs were faced with the overwhelming task of selecting icons that influenced usability and a successful device implementation (Beukelman et al., 2005). Also, characteristics of ASD increased the complexity of icon selection, which only strengthen the need for SLPs to consider iconicity when selecting symbols for individuals with ASD (Hartley & Allen, 2013; Pampoulou, 2017, Pampoulou, 2019, Pampoulou & Fuller, 2020).

The advent of technology has given individuals with ASD more opportunities to communicate with others using devices that can produce words. However, the challenge

of these devices was to design them to be usable by individuals with autism, given the complexity of the disability (Mejia-Figueroa et al., 2013; Warford & Kunda, 2018; Hartley, Trainer, & Allen, 2019; Aryanto, 2020). Gibson et al. (2020) stated that a "one size fits all approach" is not how AAC systems should be designed. Instead, facilitators should consider how individuals interact with their devices, background color, voices used, and the use of multiple styles and image sets to meet the needs of the individual.

The use of augmentative and alternative communication devices vastly improved the lives of many individuals with autism by providing tools to enhance and improve communication, so that more functional abilities were obtained. Given the specific characteristics of autism that include rigidity, difficulty with social interactions, and repetitive behavior (such as hand flapping, lack of eye contact) (NIMH, 2018), it is imperative to understand how SLPs implement AAC devices that utilized by individuals with ASD for everyday conversation. Rutherford (2012) researched how functional AAC device usages impacted behavior in children with autism. She stated that since characteristics of autism manifest so differently in individuals, verbal language was often missing, making it a difficult population to study. The use of a visual language system on AAC devices for communication has shown to be an effective tool for reducing challenging behaviors. She stated that children with complex communication needs had a decrease in the response effort when using an AAC device, which replaced challenging behavior with more appropriate behavior. The research of Rutherford (2012) expressed

why using AAC devices with individuals with autism was imperative to improve their quality of life.

Allen and Lewis (2015) reported the need for continued research in ASD and the development of language given different levels of ability that exist within the spectrum, especially in the use of pictures as a communication system in early childhood education. They gave an example of a child with ASD picking up a teapot by the spout rather than the handle to illustrate how these individuals manipulated an object in a manner differently from others.

Hartley et al. (2019) found that for individuals diagnosed with ASD, especially those with minimally verbal skills, recognizing the features of the pictures (shape, color, size) were more applicable in the overall development of independence for mapping on the device. However, Hartley et al. (2019) stated that to fully understand, one must consider both picture comprehension and picture production. Therefore, this current research is relevant because it was used to help develop recommendations for SLPs to use when establishing a new AAC device for an individual with ASD and their family.

It is known from autism research that routine and consistency are important aspects in the lives of individuals diagnosed with ASD lives, and in their learning, keeping items the same is imperative to them being able to function. When devices were change or upgraded, the new mapping caused the child to regress because whatever button the individual had learned to push for a certain item may no longer be available or in the same position. For example, when Apple upgraded their operating system to iOS 7,

the locked home screen changed from squares to circles, and the “enter” button moved from the bottom to an “ok” button at the top. This subtle change was difficult for typical children to make but for children diagnosed with ASD this type of change would cause a major setback in how they communicate with others.

As the use of AAC devices increased, continuing to understand the barriers of usage for these devices helped developers design more user-centered tools and reduced the abandonment of these devices. Baxter, Enderby, Evans, and Judge (2012) researched the barriers that often arose when using AAC devices by conducting a review of literature of existing research. They identified 27 articles that reportedly spoke to barriers families perceived when using AAC devices. Key barriers found were ease of use, reliability, availability of technical support, voice/language of the device, making decisions, time generating a message, family perception, support, role of the communication partner, service provision, and staff training. The review led to a significant recommendation of the need to involve the users and their families in the design of the devices to avoid abandonment. By focusing more on the communication needs of the user and their intended communication partners (e.g., ensuring the visual language system relates to the user), the AAC device becomes more functional and has a purpose in the individual’s life.

Barriers and Issues

The research on AAC devices across multiple environments for individuals with ASD inherently presented some barriers to the research. The first possible barrier is the lack of focus on the specific characteristics of individuals with disabilities and how symbols are selected for use on AAC devices for these individuals (Pampoulou & Fuller, 2020). Pampoulou and Fuller stated that individuals with complex communication needs benefit from the use of AAC devices but there needs to be a better understanding of how to effectively use these devices to avoid abandonment or rejection.

The second barrier was that SLPs may have lacked background knowledge of specific characteristics of ASD that impaired their use of AAC devices. According to the American Academy of Pediatrics, ASD is based in neurology but manifests itself in behavior that is displayed differently in individuals based on age, language levels, and cognitive abilities. Atypical development in language causes many individuals diagnosed with ASD to rely on gesturing to accommodate, making the task of the SLP more challenging in terms of establishing a form of language and communication.

Statistically, in the 2018-19 school year, 762,000 individuals diagnosed with autism were serviced through special education services from ages 3-21, which amounted to 1.5% of the student population (U.S. Department of Education, 2021). SLPs' primary place of business was within the public-school setting, where the range of students with disabilities required different applications of communication devices.

Hartley and Allen (2013) indicated that individuals with ASD map words differently; therefore, they require a different approach to AAC symbol set design and implementation to be successful when utilizing the device. Pampoulou (2019) and Pampoulou and Fuller (2020) noted that there was a limited body of knowledge for SLPs to rely on when choosing the desired setup for the user. The main area of concern was the uncertainty of the experience SLPs with individuals diagnosed with ASD and how that uncertainty may influence their selection of symbols used on AAC devices.

Limitations and Delimitations

Limitations of the Study

Some limitations challenged the validity of the study. The participants were recruited from local facilities and educational institutions that were identified as environments that serviced individuals with ASD within Ohio. The researcher wanted to include SLPs who worked in a variety of environments to reflect the different uses for AAC devices; however, this was not possible due to availability and timing.

The interactions between the researcher and the participants may have been impacted by the researcher restating thoughts and ideas of the participants that could display bias and preconceived idea, which could impact how the participant responds. The restatement of perceptions and ideas could change the understanding between both participants during the interview process. To prevent the participant from being persuaded to answer questions in a particular manner, every effort on the part of the researcher was made to refrain from interjecting thoughts and opinions into the process.

The researcher recorded all the interviews with the permission of the participant to avoid interruptions and provide a more natural flow of communication between the researcher and the participants.

Delimitations of the Study

Smith, Larkin, and Flowers (2009) recommended using a homogenous sample group when using Interpretive Phenomenological Analysis for research. The delimitations of this study have been identified as the primary group being SLPs who have experience servicing individuals with ASD. The purpose of this IPA research is to better understand the lived experiences of SLPs who have had experience working with individuals diagnosed with ASD and who utilize an AAC device to communicate. The SLPs interviewed have obtained the required credentials within the field of speech language pathology to work with individuals diagnosed with disabilities and have received training to assess students properly.

Definitions of Terms

AAC Team: A group of experts led by an intervention specialist that included family, caregivers, teachers, and speech-language pathologists to facilitate AAC device implementation (Beukeman et al., 2005).

Aided Communication System: Communication by use of tools or equipment (American Speech-Language-Hearing Association, 2015).

Assistive Technology (AT): Any item, equipment, or product system that was used to improve functional capabilities of an individual with a disability (United States Department of Education, 2016).

Augmentative and Alternative Communication (AAC): All forms of non-verbal communication used to express thoughts, needs, wants, and ideas (American Speech-Language-Hearing Association, 2015).

Autism Spectrum Disorders (ASD)**:** A neurodevelopmental disorder characterized by impairments in social interaction, repetitive patterns of behavior, and communication. (Mejia-Figueroa 2013).

Diagnostic and Statistical Manual of Mental Disorders (DSM): The standard U.S. healthcare system classification of intellectual disorders used by mental health professionals that provided diagnostic criteria for every psychiatric disorder (American Psychiatric Association, 2016).

Iconicity: The resemblance of the symbol to its referent. Highly iconic symbols (photographs) were labeled as transparent, while moderately iconic symbols were black and white drawings and were considered translucent, and symbols with little resemblance to the object were considered opaque as defined by Fuller (1997).

Individualized Education Program (IEP): A written educational plan for a child with a disability that was developed, reviewed, and revised for the individual by a team that consisted of parents, educators, and individuals with specialized focus (United States Department of Education, 2016).

Individuals With Disabilities Education Act (IDEA): Untied States law governing the Education of Children with Disabilities (United States Department of Education, 2016).

Symbol: An item that represented another thing or concept (Stephenson, 2009).

Unaided Communication System: A means to communicate by conveying messages by the user's body through gestures or sign language (American Speech-Language-Hearing Association, 2015).

Usability*:* As defined by the International Organization for Standardization (ISO), usability is the degree to which an item can be utilized with adequacy, effectiveness, and fulfillment in a predetermined context of use.

Summary

This chapter introduced the study of AAC devices and the importance of iconicity to individuals diagnosed with autism spectrum disorder, discussed and identified barriers arose with symbol selection, and provided a contextual basis for the research. At the heart of the research is the processing of these symbols and icons with individuals with autism who are prone to processing their thoughts and ideas into pictures. The problem addressed in this research was to continue the work of Hartley and Allen (2014) and Pampoulou (2017) to examine how SLPs choose the symbols and pictures displayed on AAC devices for users. The goal of the research was to identify the factors that influence ongoing symbol selection so that recommendations could be applied by SLPs when implementing AAC devices for individuals with ASD.

Chapter 2

Review of the Literature

Autism and Communication

Autism Spectrum Disorder is a neurological disorder that is typically diagnosed as impairments in social communications and interactions, restrictive and repetitive behaviors (Livingston, Colvert, the Social Relationships Study Team, Bolton, and Happe, 2019). ASD is also known to have a significant impact on the adaptive living skills of the individual and their ability to use communication in social situations (AAP, 2020; Clarke and Williams, 2020; Hayes, Hirano, Marcu, Monibi, Nguyen, & Yeganyan, 2010). Children are typically screened between 18-24 months by their pediatrician who will ask the parent a series of questions to determine if the child is reaching developmental benchmarks. Characteristics that usually raise red flags for physicians are trouble sleeping, gastrointestinal issues, wandering, and most importantly little to no language development (AAP, 2020).

Behavioral issues are also of great concern as they are typically presented into two domains: social communication/interaction and restricted/repetitive patterns. Individuals diagnosed with ASD show abnormal behaviors when interacting with others, lack of eye contact, and misunderstanding of gestures or intent. Individuals may also have deficits in the imitation and processing of information in vision (gestures) and

hearing (language). There may also be some repetitive behaviors that are related to deficiencies in their processing of sensory information (AAP, 2020).

DSM-5 redefines ASD to focus more on specific symptoms that are displayed by individuals and requires that they show deficiencies in all three areas of symptoms: social-emotional reciprocity, verbal and nonverbal communication, developing relationships and in at least two of the four areas in restrictive and repetitive behavior (AAP, 2020; APA, 2016).The DSM-5 further breaks down the diagnosis to levels of severity that are based on social communication impairments, along with the restrictive and repetitive patterns of behavior displayed. Specifically, an individual diagnosed at level one may struggle with social interactions and maintaining relationships but is able to communicate and function independently with some support. As an individual diagnosed at level two may show some deficiencies with verbal and non-verbal social communication skills, limited social interactions, and difficulties with daily functional activities even with substantial supports in place. At level three, the deficiencies are extremely impaired with low functioning skills in every aspect of life, requiring very substantial support. Individuals at level three also display inflexibility in behavior, struggle with changes, and have restricted/repetitive behaviors that greatly interfere with their ability to function.

Hartley, Trainer, and Allen (2019) stated that individuals with ASD display significant delays in communication with severe impairments in the development and expression of language. These individuals also show an atypical understanding of

symbols that illustrates the deficiencies in their development of language. Furthermore, Wainwright, Allen, and Cain (2020) stated that individuals diagnosed with ASD are significantly delayed in receptive and expressive language and often communicate using pictorial symbols to an alternative way to speak.

To help individuals with ASD and their families, intervention needs to occur early on with the help of visual supports to represent concepts and ideas that an individual would experience in the real world. The use of these types of visual supports help reduce some of the symptoms of ASD in cognitive development, communication, and social interactions (Hayes et al., 2010; Hartley, Trainer, & Allen, 2019; Wainwright, Allen, & Cain, 2020). Visual supports are defined as things that were seen and enhanced the communication process (Hayes et al., 2010) and consist of images and tangibles that reflect everyday items. Hayes et al found individuals with ASD used low or high-tech devices to help build their communication skills. While low-tech tools were often used with beginners, more experienced users of visual supports utilized an augmentative and alternative communication device.

Kunda and Goel (2011) presented a framework to help define the way an individual with autism processed information by redefining their earlier idea of thinking in pictures as a disposition towards using visual mental representations over using visual and verbal mental representations found in typically developing individuals. In their study, Kunda and Goel created a series of tasks that required both visual and verbal mental representation of typically developed individuals and individuals with autism.

Kunda and Goel explored several theories to examine the cognitive processing of thinking in pictures as it relates to ASD in congruence and divergence. The three theories include Executive Dysfunction, Weak Central Coherence, and Enhanced Perceptual Functioning. Executive Dysfunction theory states that an individual with autism is impaired in higher-level cognitive skills where goal-oriented behavior is utilized to gain an understanding of the information provided (planning, set-shifting, and generativity). Kunda and Goel (2011) stated that while there were commonalities between their hypothesis of thinking in pictures and Executive Dysfunction, more research was needed to make the connection between how one thinks in pictures to how their brain processes through executive functions.

The Weak Central Coherence (WCC) theory states that an individual with ASD would show bias towards local processing over global processing (Kunda & Goel, 2011; Hatfield, Brown, Giummarra, & Lenggenhager, 2019; Livingston, Colvert, the Social Relationships Study Team, Bolton, Happe, 2019). Essentially, individuals diagnosed with ASD show a preference to items and situations that related to their common surroundings verses the world around them (Livingston et al., 2019). This finding was in alignment to research completed by Kunda and Goel (2011) who expressed concern that the Weak Central Coherence hypothesis did not address modalities outside of local and global processing; however, it did raise the question of whether this theory should be expanded to cover perceptual/verbal differences along with exploring concrete explanations of individuals with autism.

The Enhanced Perceptual Functioning (EPF) theory suggests that individuals with ASD show weak performance skills in perceptual processing in various modalities and did not utilize prior conceptual knowledge (Kunda & Goel, 2011). It is believed the ability by individuals with ASD to complete a visual task is due to local and perceptual processing (Neufeld, Hagstrom, Westeinde, Lundin, Cauvet, Willfors, Isaksson, Lichtenstein, & Bolte, 2019).

Kunda and Goel concluded that the idea of thinking in pictures should be seriously considered as a method of cognitive processing for individuals with ASD in conjunction with behavior and neurobiological actions, especially in the subgroup diagnosed specifically as autistic. The importance of understanding the idea of thinking in pictures helps the team of providers who work with individuals with ASD better communicate their thoughts and ideas in a manner that not only make sense to them, but also to the people they interact with daily. The use of pictures was also shown to improve behavior and impacted their quality of life of individuals with autism.

Ganz, Mason, Goodwyn, Boles, Heath, and Davis (2014) performed a meta-review process that studied the interactions of individuals with ASD and AAC devices with the intent to better understand the characteristics of the participants and how they related to their interaction with AAC devices. Ganz et al. stated that AAC devices were intended to be used as a supplement or take the place of spoken and written communication. Individuals with ASD often required the use of AAC devices due to the impairment exhibited with communication (Ganz et al., 2014). These devices were either

aided (speech generated devices, PECS) or unaided (gestures, sign language) based on the need of the individual; however, most devices used with individuals with autism were aided.

A total of 292 articles that focused on Asperger's, PDD, Autism, AAC, augmentative communication, PECS, and other areas related to AAC devices were gathered and analyzed (Ganz, Mason, Goodwyn, Boles, Heath, & Davis, 2014). The purpose was to investigate how the characteristics of ASD impact the effectiveness of three types of AAC devices: Picture Exchange Communication System (PECS), Speech-Generated Devices (SDGs), and other picture-based communication systems. While the results of the meta-analysis showed that individuals diagnosed with ASD only performed better with speech-generated devices, individuals diagnosed with ASD along with other disabilities performed better using a picture-based system.

Stoner, Angell, and Bailey (2010) stated that a major benefit of high-tech devices was the oral messages produced would be better understood by a wider variety of communication partners making it easier for the individuals with autism to express their thoughts and feelings. Two main challenges were (1) finding a device during the selection process that appropriately fits the user and utilized symbols that have functional uses to the individuals with autism and (2) matched devices that were specific to the characteristics of autism and how those characteristics impacted a user's experience with AAC devices.

In this study, one child was the subject of focus for Stoner, Angell, and Bailey (2010), yet their findings can be taken into consideration when looking at other individuals. Stoner et al. stated the importance of considering the age and developmental level of the user when introducing an AAC device to factor how successful it was with the individual. They noted that due to the early exposure their participant had with assistive technology, introducing an AAC device to him later in life was not a difficult transfer. Developers of future devices should be able to tailor the technology to meet the communication needs of individuals with autism.

Speech Language Pathologists

The Speech-Language Pathologist (SLP) plays a crucial role in the education of the individual diagnosed with ASD. SLPs server as the facilitators of AAC devices and the users. The American Speech-Language-Hearing organization has established a credential portion that oversees the certification of SLPs. Certification standards focus on eight primary areas: degree, education program, program of study, knowledge outcome, skills outcome, assessment, clinical fellowship, and maintenance of certification. According to ASHA, all SLPs must hold at least a master's degree or higher to meet the requirements of the first standard. All degrees must come from an accredited college or university that is completed in a Council on Academic Accreditation program. The student must also complete a minimum of 36 hours of coursework that includes academics and supervised clinical experiences to gain knowledge in statistics and the biological, physical, and social/behavioral sciences. Knowledge of basic human

communication and swallowing processes and the principles and methods of assessments, interventions, and prevention for persons with communication and swallowing disorders must also be demonstrated. Ethical conduct, research, contemporary professional issues are required for the SLP certification process.

At the heart of the certification process is the demonstration of knowledge in the specific skills needed as an SLP that includes: the use of oral and written communication when talking with others or writing reports, conducting screenings and evaluations, adapting evaluation procedures to meet the needs of the individual, interpreting and synthesizing information to diagnose and implement intervention plans, measure growth and performance of the individual, and utilize team-based collaborative practices. Once the SLP has earned their certification, they must then complete a minimum of nine months of full-time clinical experience with patients to include 400 clock hours of supervised clinical experience in speech (25 hours in guided clinical observations, 375 hours in direct patient contact) (ASHA, 2020; Clarke & Williams, 2020).

The pathway to becoming an SLP devotes a large amount of time to direct care and focus on individuals with specific speech impairments that do not often require the use of an AAC device; therefore, limiting their experience and knowledge of these types of devices (Clarke & Williams, 2020). Mendonsa and Tiwari (2018) surveyed the knowledge and confidence of SLPs as it relates to individuals with ASD and found that SLPs who had behavioral training tended to display higher knowledge and confidence than those who had no training. Those who lacked training tended to view individuals

with ASD as having an emotional disorder or as individuals who possess special talents or abilities. SLPs who worked in schools showed good knowledge of the general characteristics of ASD but did not demonstrate strong knowledge of the core deficits typically displayed in individuals with ASD.

The primary role of the SLP is to serve as the practitioner or facilitator of AAC devices. Other members of the team that can also be considered a practitioner are the occupational therapist, the assistive technology specialist, and special education teachers. Douglas, West, and Kammes (2020) defined the practitioner as the professional tasked with providing support to the individual who needs the AAC device. Their role is to be well versed in academic, linguistic, and social contexts and provide training to other staff members, as well as operate and implement programs on the device, while also providing intervention as needed (Douglas, West, & Kammes, 2020).

The Speech-Language Pathologist (SLP) is typically responsible for assessing and recommending the type of device an individual should use for their level and need of communication. The assessment process gives the SLP the opportunity to learn about the likes and dislikes of the user, their needs and wants, the environment where the device will be used, the communication partners, and the symbol preferences. The SLP will collaborate with the teacher to ensure the academic needs are being met and that the structure of the page layouts is aligned with communication needs (Clarke & Williams, 2020, ASHA, 2020).

Along with assuring that the correct device is selected, the SLP ensures that the user has the physical ability to access the various components. Stoner, Angell, and Bailey (2010) stated when selecting AAC devices for individuals with complex communication needs, physical and cognitive abilities of the user needed be taken into consideration. Individuals with ASD are known to characteristically display a wide range of differences of social, cognitive, and language differences, specifically in speech where up to 30% of these individuals will experience limited expressive language skills (Clarke & Williams, 2020). Clarke and Williams (2020) stated that individuals with ASD tend to show differences in their perceptions and processing of visual and auditory information that is presented in multiple modalities that greatly impact their efficiency when using communication support systems. These individuals were subsequentially found to notice less synchronicity of dual inputs and rely more on eye gazing information to obtain visual input before auditory input. This form of processing requires the SLP to be fully engaged with the individual and have a full understanding of their learning styles and abilities. However, it is unknown as to how SLPs acknowledge these issues or develop interventions and adaptations with individuals diagnosed with ASD, especially when using an AAC device since most university programs barely introduce AAC beyond the bachelor's degree program (Clarke & Williams, 2020; Pampoulou, Theodorou, and Petinou, 2018).

AAC Devices

Augmentative and Alternative Communication Devices (AAC) are defined as a form of assistive technology that is presented in an aided or unaided form to help facilitate communication between individuals with complex communication needs and those without. Individuals who typically use an AAC device are individuals diagnosed with apraxia of speech, cerebral palsy, traumatic brain injury, aphasia, progressive degenerative diseases, and various developmental disabilities, including ASD. These individuals will not often use speech in the same manner as their typically developed peers due to their struggle to comprehend and express language and will require the use of an AAC device to function in society (Ivy, Robbins, & Kerr, 2020). An aided device is one that is classified as a speech-generating device (SGD) or voice output communication aids (VOCA) that are designed around specialized proprietary software that utilizes a series of symbols and pictures to represent words and concepts in one's language for a particular device (Pampoulou, 2018). Unaided devices are considered lower level supports that use cards and letter boards for communication and are less demanding on the user because they do not require computers and are not complex in their setup (Clarke & Williams, 2020; Ivy, Robbins, & Kerr, 2020; Pampoulou, 2020).

Bondy and Frost (1994) developed the Picture Exchange Communication System (PECS) to help young children diagnosed with autism develop a means to communicate with others through pictures. Communication systems were available since the 1950's but required students only to point to a picture to indicate what they wanted (Hourcade,

Pilotte, West, & Parette, 2004). Bondy and Frost observed that preschoolers diagnosed with autism were not motivated to engage with a communication partner because that child would be looking out the window while pointing to a cookie and the partner did not know if the child was actively engaged in the conversation. In a typically developed child, they could engage in a match-to-sample activity such as "point to the red cup" when verbally prompted and did not require any reward for the exchange. For a child with autism, the reward was needed to actively involve them in communication (Bondy & Frost, 1994). They found that requesting an object provided the child with an appropriate reinforcement to learn the system.

The foundation of PECS was that a young child was taught to use a picture to exchange with a communication partner to obtain an object or item of their desire; hence they initiated a conversation (Bondy & Frost, 1994). In the beginning, the facilitator observed what objects were the most desired and used those to begin the PECS training. As the child gained more confidence in exchanging pictures, the partner increased the interaction by placing more undesirable items in the environment along with the desired object to encourage more dialog. Conversations would become more spontaneous, and the child was expected to discriminate between more pictures. The communication partner continued through all six phases that concluded with the child being able to put sentences together in response to questions asked or stating their thoughts and ideas.

One of the key findings in the study of Bondy and Frost was that the success of the PECS program stems from the use of pictures that were already recognized in the real

world by the child and helped them learn how to initiate communication with others. For children diagnosed with autism, this was especially important as it continued to illustrate the importance of pictures when used for communication.

The use of PECS is still a common practice with SLPs but the need for more effective systems requires individuals to utilize more AAC devices for daily communication. For individuals with compromised cognitive abilities, their limitations in working memory pose significant challenges in developing a communication system, which also makes it difficult for SLPs to select symbols for AAC devices (Chan, Sato-Shimokawara, Bai, Yukiharu, Kuo, & Chung, 2020). AAC devices not only assist in the facilitation of communication, but also help to expand language, support academic growth, and provide a means for the individual to participate in activities with their families, friends, and community. In school settings, collaboration and training is needed between the SLP, teacher, parent, and others who may interact with the individual for the sake of communication to ensure that they understand how to operate the AAC device and use it effectively with the individual. Acceptance of the AAC devices is a key component to its continued use and support, development, and success of the communication needs (Pampoulou & Fuller, 2020; Pampoulou, Theodorou, and Petinou, 2018; Ryan, Shepard, Renzoni, D'Alessandro, & Oh, 2020).

A major characteristic of AAC devices is its use of symbols and pictures as a form of language for its users. The designers of AAC devices tend to use tactile or tangible symbols that replace graphic symbols and pictures to reduce the burden on users'

cognitive, sensory, and physical demands (Ivy, Robbins, & Kerr, 2020). Ivy et al. (2020) found that tangible symbols had a significant impact on users who learned with dual sensory impairments because it provided the users to develop receptive understanding of the symbol if there was explicit instruction on its expressive use. Without the instruction, the user did not automatically associate the symbol with receptive understanding (Ivy et al., 2020).

One significant challenge of SLPs as it relates to AAC devices is understanding the unique qualities of disabilities and the specific needs of the individual. Moorcroft, Scarinci, and Meyer (2019) examined the barriers that facilitators face when trying to determine how to best address the communication needs of individuals diagnosed with a complex communication disorder. For example, an individual with Down syndrome who has the cognitive ability to express themselves may have struggles using their tongue causing an impaired body function that impacts their ability to produce intelligible speech, which can keep them from playing with their friends, communicating with a doctor, or expressing their needs to others. An AAC device could alleviate their challenges by providing the individual with a means to pronounce words and phrases to others without feeling the stress and embarrassment of trying to use verbal communication. For an individual diagnosed with ASD, their needs could be different, yet the approach to their instruction is often the same, which further complicates the role of the SLPs ability to design a communication system specifically to an individual with ASD (Moorcroft et al., 2019). The International Classification of Functioning, Disability,

and Health (ICF) created a framework that can be used by SLPs and other professionals to assist in the alignment of a person's health condition and their body structures and functions as it relates to their ability to execute tasks and their involvement in life activities. Environmental and personal factors are also considered into their relationship to the individuals disability. A strength of this tool for SLPs is that it divides speech functions and communication functions, including communication devices. The ICF then allows the SLP to identify barriers to the user and evaluate intervention effectiveness demonstrated by the user in various settings and with various facilitators. The benefit of this allows the SLP to gain a sense of what symbols should be used based on usage and need of all involved (Moorcroft et al., 2019; Rowland, Fried-Oken, Steiner, Lollar, Phelps, Simeonsson, & Granlund, 2012).

Iconicity

Iconicity is defined as the perceptual resemblance between a symbol and the object it visually represents (Hartley and Allen, 2013; Wainwright et al., 2020). Pampoulou (2019) also explored the significance of iconicity and how it was found to be one of the key factors in the symbol selection process of SLPs. Specifically, Pampoulou found that the use of color plays a major role in helping young children recognize and remember the symbols presented to them.

Symbols are around us in every facet of life from road signs to labels on our clothing. They are a form of communication used to help us understand the world around without the need for words to describe the object. For individuals with delays in receptive

and expressive language development, in those diagnosed with ASD, using symbols as an alternative to speech has shown to be an effective method for communication given their strength in visuo-spatial processing. What is unknown is their understanding of the meaning of the symbols (Wainwright, Allen, & Cain, 2020).

Wainwright et al. (2020) wrote that in a typically developing (TD) child, the understanding of symbols emerges around the age of 18-24 months, where TD children can map new nouns to their related picture in their second year of life. They are also able to show shape-bias when categorizing objects and generalize the object to different colors. In individuals diagnosed with ASD, they were not able to make the connection that the words and pictures referred to an object but showed that the symbol itself was restricted to a particular label with no flexibility in the object as it relates to color or shape. This was further studied in TD children who were 15-18 months of age and it was discovered that an infant as early as 15 months old was able to generalize a label to its real-world referent. This led researchers to determine that increasing the iconicity of a picture enhanced the symbolic understanding, which is a crucial finding for an individual diagnosed with ASD since they have been shown to interpret pictures differently, specifically relying on the resemblance of the object not necessarily the details.

Hartley and Allen (2013) categorized symbols into three primary categories that explained the strength of its meaning:

1. Symbols that were highly iconic were labeled as transparent. For example, the "MCDONALDS" icon for Boardmaker (see *Figure* 1):

Figure 1: Sample of a highly iconic symbol from Boardmaker

2. Symbols that were moderately iconic were labeled as translucent. For example, the "APPLE" icon for Boardmaker (see *Figure* 2):

Figure 2: Sample of moderately iconic symbol from Boardmaker

3. Symbols with little or no resemblance to their known object were labeled as opaque. For example, the "YES" icon for Boardmaker (see *Figure* 3):

Figure 3: Sample of a symbol with no resemblance to its object from Boardmaker

Manufacturers of AAC devices and tablets like the iPad that support communication apps use iconic pictures and symbols as the foundation for their language system to represent objects, concepts, feelings, and actions in the form of drawings, gestures, expressions, and photographs. Ding, Draffan, and Wald (2020) described how the symbols on these dedicated communication devices are developed by the company and are represented as three primary types of symbols: alphabet, single meaning, and multiple meaning. A single meaning symbol indicates that it represents one word or one meaning. A multiple meaning symbol indicates that it represents a combination of pictographic symbols that are used in a variety of phrases based on the conceptual meaning of context (see Figure 4).

Figure 4

(a) Alphabet (b) Single Meaning (c) Multiple Meaning

Three different kinds of symbols: (a) Alphabet; (b) Single Meaning; (c) Multiple Meaning: man, sad, worried, or young.

DeLoache (1995) developed a research model that highlighted the significance of instruction as a major factor in achieving the understanding of a symbol as information. Instruction directly facilitated mapping of a symbol and influenced representational insight, which was the realization of a symbol – object relationship. Also, instruction had

an indirect role in symbol selection through the perception of similarity and iconicity, which, in turn, influenced mapping and representational insight. DeLoache found that symbolic understanding was a result of direct instruction. The model puts forth several interrelated factors that influenced behavior.

The factors were influenced by several mediating variables that influenced symbol use. The social context and representational insight contributed to the transfer of symbolic knowledge to the user. When a facilitator selected an icon that closely represents the known object, the better the experience with the device will be for the user.

Stephenson (2009) further examined iconicity as it related to symbols with a focus on concrete symbol references. She stated that for individuals who have little to no spoken word, the graphic symbol might be used to express both comprehension and production. Stephenson completed a meta-analysis of research done on the topic of iconicity and symbol usage with a focus on the DeLoache model. She identified the four factors that impacted representational insight: 1) iconicity and symbol use, 2) social context of symbol use including instruction, 3) the significance of the symbol, and 4) symbol experience.

Within the DeLoache model, Stephenson noted that children nine months old mostly chose color photos followed by black and white, then photos with colored lines, and finally black outlined drawings. The significance of this was that instruction should focus on the picture as a symbol to understand the relationship between the picture and the object it referenced. Stephenson also suggested that future work be completed that

explored the factors identified by DeLoache as there were more significant factors on graphic symbol use amongst individuals with autism and other disabilities.

Usability

Hajjar, Alharbi, and Ghabban (2021) attributed the ease of use of mobile and wireless devices to three primary things: adequacy, effectiveness, and fulfillment within a specific environment. Adequacy is defined as the level at which an individual can achieve their objective within a specific area. Adequacy is often measured by the quality of how it meets the solution and its error rates. Effectiveness is viewed as the relationship between accuracy with how the users achieves their goals and the resources used to achieve them. Effectiveness is typically measured by task completion time and learning times. Fulfillment is the user's comfort and attitude toward the use of the device and is measured by user satisfaction ratings from surveys. The concept of usability must be considered and factored into the designing of AAC devices if they are to be effective, especially with the growing use of mobile devices (Weichbroth, 2018).

A major struggle in the usability of assistive technologies for individuals with ASD is the consideration being given to how these individuals overall interact with technologies. Farzana, Sarker, Hossain, Chau, and Mamun (2020) found that 76% of individuals diagnosed with ASD will see no growth in their ability to communicate beyond the basic level and 30% will never speak, making the usability of devices to be of utmost importance for these tools to drastically impact their quality of life. It has been suggested that three principles be considered in the design of devices for individuals with

ASD to ensure for ease of use: 1) simple layout-focuses on the task at hand, 2) no negative feedback-error sounds can be perceived as amusing causing an individual with autism to create mistakes purposely, and 3) adjustment-have options available to fit their needs and interest (Farzana et al., 2020; Gibson et al. 2020; Robertson, 2005). Robertson (2005) stated that the study of how individuals with autism interacted with technology had not been widely researched. One primary reason for this lack of focus is due to the wide range in which ASD manifests itself in individuals. Aguiar, Galy, Godde, Tremaud, and Tardif (2020) further stated that due to the complex nature of the symptoms of ASD and the environment the individual functions, the need to view each case must be treated as a unique situation with interventions adapted according to the specific needs of the individual. Furthermore, Aguiar et al. (2020) strongly advocated for individuals with ASD to be active participants in the design of AAC devices stating that by their involvement, software designers ensure the specifics are compatible with their needs. One major failure of AAC devices is that characteristics, limitations, needs, and expectations of the users are not considered and are often unsupported by a tech department nor is the usability, ergonomics, and interaction of the user given priority in the design process. Aguiar et al. (2020) acknowledged that challenges exist in the promotion of involving individuals with disabilities in general but if the design of AAC devices is to improve, it is imperative to include these individuals in all phases of the design process.

Grynszpan, Martin, and Nadel (2005) conducted a study that also looked at autism in the context of the usefulness of computers and software design by comparing two learning domains: social dialogue understanding and spatial planning. Grynszpan et al. hypothesized that individuals with autism were less skillful in the domain of social dialogue understanding versus spatial planning. Individuals identified with a lower IQ were low functioning or had autism. Research had primarily focused on high functioning individuals with autism given their ability to comprehend more and function somewhat more independently. Grynszpan et al. stated that there was a lack of research in computer-based interaction and autism and that no protocols had been developed to evaluate the efficacy of computer-based approaches with individuals with autism. The goal of their research was to investigate computer-based interaction that would help developers create and design applications that were specific to autism because socially abstract expressions were extremely difficult to interpret and understand.

Sampath, Agarwal, and Idurkhya (2013) researched the design approach given to tools used with children diagnosed with autism. They examined two applications that focused on communication and social skills. The programs were *AutVisComm*, an assistive communication system developed for use on tablets, and *Autinect*, a set of social activities used with Microsoft Kinect.

Twenty parents of individuals with autism participated in the study, and one young male (age 8) and his mother participated in the design process. The study was conducted with four children with autism (three males, one female) and their teacher

initially, but then expanded to 24 classmates once it was time to begin to learn how to communicate using the *AutVisComm* program and the teaching of social skills through the *Autinect* program avatars.

Sampath et al. discovered that the variance of the symptoms of ASD impacted one's ability to design an application for an individual properly. Involving parents and teachers in the design phase of any form of assistive technology is imperative because their use of the device has to be considered. Parents and teachers often serve as the therapist when the specialist was not available; therefore, the parents' and teacher's knowledge of the device is an important component to a child's successful use of the device.

Sampath et al. discovered that extreme attention to the details of the display was needed, as well as consideration for the fine motor skills of the child with autism. They also discovered that the repetitive behaviors of children with autism impeded their ability to use the programs; therefore, keeping the child engaged helped reduce those issues. Overall, Sampath et al. stated that the cognitive profile of the child needed to be of utmost importance to consider when designing an interface for usage.

To further extend this point, Belani (2012) stated that while AAC devices and other assistive technologies have made it possible for individuals with disabilities to have access to these tools, engineers are not always mindful of their needs in the design process, which makes it difficult for these individuals to use. Belani recommended that in the engineering phase three items be taken into consideration: 1) requirements gathering-

taking the time to determine what is needed by the user, 2) requirements specification-determine what functions are needed, and 3) requirements verification-ensuring that functions are correct for the user.

Aguiar et al. (2020) saw a need for guidelines to be developed to help software designers develop programs for individuals diagnosed with ASD. The adaptation of AAC devices should involve the features that focus on functionality, interactions, and appearances of the interface, with the objective being to customize the system to the user's developmental and cognitive level. During the requirement phase, observations and recordings are done of the user to obtain useful data as to how the device is utilized. In the design phase, a prototype is used as a part of the usability assessment. The difficulty Aguiar et al. (2020) encountered with individuals diagnosed with ASD was the struggle they faced using the prototype device because it was of lower quality, was not customized to the user's needs, and they were unsure of how to interact with it and the facilitator. This made it difficult to the researchers to differentiate the user's experience from design issues. The other challenge faced by developers of AAC devices was the characteristic behaviors of individuals diagnosed with ASD that include lack of eye contact, poor verbal/non-verbal communication, awkward social interactions, and other stereotypical behaviors.

Aguiar et al. (2020) stated that there needs to be concrete and appropriate guidelines for developers to use when designing systems for individuals diagnosed with ASD. Heuristic principles need to be straightforward to ensure the usability of the device and to

ensure the user has a good experience. Due to the uniqueness of the needs for an individual diagnosed with ASD, especially those with impaired cognitive abilities or learning disabilities, developers need to consider ASD needs differently than other disabilities.

Interpretative Phenomenological Analysis (IPA)

The Interpretative Phenomenological Analysis is a qualitative, experiential, and psychological research method that is focused on theoretical views from the philosophy of knowledge (Smith et al., 2009). The theoretical foundations of IPA are centered on three key areas described by (Smith et al., 2009) as the philosophy of knowledge. The philosophy of knowledge was made up of the areas of phenomenology, hermeneutics and idiography that together form the foundation of the IPA research (see *Figure* 5).

One theoretical foundational area of an IPA approach is phenomenology, which is centered on the exploration of a participants lived experience (Smith et al., 2009). By gaining an inside view, the researcher was better able to understand the lived world of the individual. The method seeks to understand and identify the elements of the phenomena as experienced by the individual (Pietkiewicz & Smith, 2014). The individual's understanding of the phenomena in the world around them and their sense of meaning is key to the phenomenological approach.

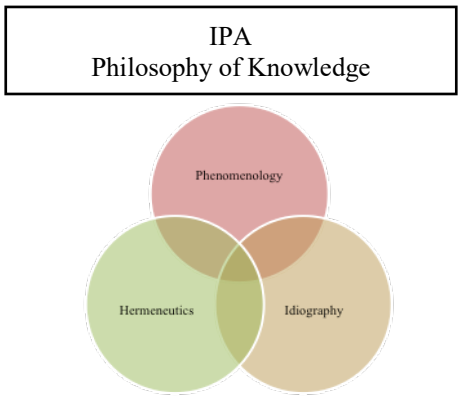

Figure 5: The theoretical foundation of IPA

The second theoretical foundation of IPA is hermeneutics, which is the theory of interpretation and how it translates to the meaning of phenomena. In IPA, Pietkiewicz and Smith (2014) explained the researcher's attempts to stand in the shoes of the individual to better understand and translate the meaning of their experiences. The combined interpretation of the meaning of the phenomena is referred to as dual hermeneutics. The dual hermeneutics process involves the individual's understanding of the events along with the researcher seeking to interpret the experience to gain the individuals perspective (Smith et al., 2009). The dual hermeneutics approach provided the researcher with a foundation for analysis to impel a deeper understanding of the phenomena and for the data to be interpreted at a different level, giving the researcher multiple perspectives to consider.

The third theoretical area of IPA research is idiography, which is focused on the detailed analysis of the context through which individuals experiences the phenomena

(Pietkiewicz & Smith, 2014). To gain the depth of analysis, the approach is stanch on the details and how an experience has been interpreted. In addition, IPAs uses smaller groups and purposively selected participants effectively captures the individual details for analysis (Smith et al., 2009). Smith explained that the approach of synthesizing analysis of multiple studies plays a significant role in the development of phenomenological models.

The theoretical areas of IPA enabled the researcher to learn about the lived experiences of the participants (SLPs). In the current study, IPA provided the opportunity to engage in a dialog between the researcher and the SLP, that encouraged authentic expression of their experience in using AAC devices with individuals diagnosed with ASD (Smith, Jarman, & Osborn, 1999). This method also provided the researcher with pertinent information to compare, interpret, and analyze through a coding process that also established emergent themes to discover what factors influence SLPs decisions for symbol selection.

IPA was applied in the research which enabled the researcher to gain a better sense and understanding of the lived experiences SLPs have with AAC devices and their use with individuals diagnosed with ASD. The rationale for the use of the IPA was based on the findings of Hartley and Allen (2013) and Pampoulou (2017) who stated that the understanding of the factors that influence symbol selection of SLPs is underdeveloped due to having a narrow view of information to base their decisions on when deciding on an icon to use on an AAC device and how that individual interpreted the meaning of the

symbol. IPA methodology was best suited to address the needs of the research to assist in gaining a depth level of understanding of the experience.

Contributions of the Study

Pampoulou (2019) studied the views of SLPs regarding their acceptance of AAC systems for individuals with complex communication disorders. Pampoulou (2019) stated that the demands of the user and the facilitator can have a negative impact on the overall acceptance of the AAC device if the user is not able to utilize the device with the recommended language system in the different environments. Webb, Lynch, Meads, Judge, Randall, Goldbart, Meredith, Moulam, Hess, and Murray (2019) stated that a gap exists between research and SLPs implementing best practices when determining the most suitable system for an individual with complex communication disabilities on an AAC device.

Pampoulou and Fuller (2020) found that symbol selection on an AAC device was primarily based on ease of use of the symbol generating software and the availability of the software for any individual diagnosed with a disability who could benefit from the use of an AAC device. The current study aims to contribute to the field that focuses on the factors that influenced SLPs in making symbol selections on AAC devices for individuals diagnosed with ASD. The contribution is significant given the multiple challenges that are unique to the disability and the need to implement more specific language programs to these individuals to ensure their quality of life is sustained when using AAC devices on various device platforms. It is hoped that the insight obtained in

this study will help SLPs understand the significance of icon selection on AAC devices, and how the selections guide their decisions when setting up communication devices that are functional and meaningful for the AAC user in a variety of contexts.

Summary of the Research Literature

A review of the research literature investigated iconicity (DeLoach, 1995) and the influence of instruction on symbol selection for AAC devices. The research suggested individuals with autism process information in pictures (Hatfield et al., 2019; Kunda and Goel, 2011; Livingston et al., 2019) and the symbol based AAC devices are a primary means of communication (Hayes et al., 2010; Hartley et al., 2019, Pampoulou, 2018; Stoner, 2010). The design of the devices is a major area of research (Grynszpan, Martin, & Nadel, 2005; Grynszpan, Martin, & Nadel, 2007; Pampoulou & Fuller, 2020; Sampath, Agarwal, and Idurkhya, 2013). Research was slow to investigate the role of SLPs and what factors influence symbol selection on AAC devices as stated by Pampoulou (Pampoulou, 2017; Pampoulou, 2018; Pampoulou & Fuller, 2020); however, research in this area has begun to increase as more interest has been shown (Deloache, 1995; Ganz, Mason, Goodwyn, Boles, Heath, & Davis, 2014; Hartley & Allen, 2013; Pampoulou, 2017, Pampoulou, 2019; Stephenson, 2009).

This research is relevant as it explores how an individual diagnosed with ASD processes information presented to them in pictural form to use as a means of communication with others, making it essential for SLPs to utilize iconicity when selecting PECS for communication. By gaining a better perspective and deeper insights

into the factors that motivate an SLP to select a particular symbol for use on an AAC device for an individual diagnosed with ASD, this researcher hopes to improve the overall presentation of meaningful and relevant symbols on AAC devices, encourage proper training and education, and advocate for more collaboration amongst the team of facilitators to improve the implementation and use of AAC devices (Pampoulou, 2018; Pampoulou & Fuller, 2020).

Chapter 3

Methodology

Introduction

A qualitative study utilizing Interpretative Phenomenological Analysis (IPA) was conducted to understand the nature of the speech language pathologist's (SLPs) decision-making process with symbol selections on AAC devices used by individuals with ASD. The researcher applied IPA as a method to learn about the essences of the lived experiences of participants in the context of the phenomena examined (Smith, Flowers, & Larkin, 2009). Interviews were conducted with local SLPs in the Central Ohio area who serve individuals with ASD in both public and private environments. The researcher sought to address the following question:

> What factors are considered by SLPs when selecting icons on AAC devices? Pampoulou and Fuller (2020) expressed the need for research to better understand how symbols are selected for AAC devices by SLPs for a specific population.

Aim

The research goal was to identify factors that influence symbol selection. Hartley and Allen (2013) stated that individuals with ASD are more successful at symbolic understanding when iconicity or icon design is the primary focus in selecting symbols. Pampoulou (2017) stated that while symbol sets are developed for AAC users, there is a lack of understanding of the factors that SLPs use to select a symbol for individuals with ASD. Pampoulou and Fuller (2020) explored the selection of graphic symbols on AAC

devices on individuals with disabilities with no regard to any specific disability group. However, Pampoulou and Fuller (2020) stated that individuals diagnosed with ASD use graphic symbols more effectively than other disability groups. Therefore, focusing specifically on understanding how symbol selection impacts communication skills of individuals diagnosed with ASD will lead to decisions by professionals that improve the quality of life for those individuals.

Rationale for Choosing the Method

A substantial number of studies have focused on symbol selection with various AAC devices, but there are limited qualitative inquiry studies into what considerations SLPs explain they consider when they select particular symbols for AAC devices for individuals diagnosed with ASD (Pampoulou, 2017; Pampoulou & Fuller, 2020). Pampoulou and Fuller (2020) used a survey to gather insights from SLPs, but their study did not capture first-hand details from SLPs that described details about their experiences in working with AAC devices and the considerations and decision processes they follow in symbol selections.

The use of phenomenological inquiry enabled the researcher to provide more context and detail to factors that influence an SLPs decisions related to the selection of symbols on AAC devices for individuals diagnosed with ASD. This research method generates a narrative of the participant's background and knowledge of symbol selection, and insights into how their understanding of symbols directly impacts their decision-making process (Pampoulou & Fuller, 2020). The researcher desired to also understand

the perspective of the SLPs. Applying Interpretive Phenomenological Analysis (IPA) provided the researcher with the necessary interpretative process to identify the lived experiences of a small sample of SLPs who assist in symbol selections for individuals diagnosed with ASD.

Participant Selection

Sampling

The ideal sample size of three to eight people is ample to conduct an IPA study according to Smith et al. (2009). This sample size gives the researcher the opportunity to focus on a smaller number of cases and obtain quality information. The ideal participant in this study included SLPs who met the following criteria to participate: (1) they have experience in the field for a minimum of one year, (2) they have a background in the assessment, training, and implementation of AAC devices, and (3) they have knowledge of ASD and its characteristics. Following approval of the study by the Institutional Review Board (see appendix A), the researcher reached out to the director of Haugland Learning Center to initiate the recruiting process. The director also served as the pilot participant of the study.

Pilot Participant

The pilot participant (i.e., the director) was recruited by personal invitation on July 5, 2018, via email. She was recruited due to the researcher's personal experience with the facility. The pilot participant leads a team of SLPs and occupational therapists. She had 27 years of SLP experience with 26 years specialized in servicing individuals

with ASD along with a background in Applied Behavior Analysis (ABA). In addition, the pilot participant provided a wealth of knowledge and background about the facility.

The pilot participant responded on July 5, 2018, via phone, where the researcher explained the focus of the research and the need for recruiting participants. The pilot interview was conducted in person that involved a conversation around ten open ended questions capturing the participants background, education, and training along with process of AAC symbol selection. On July 6, 2018, the pilot participant (i.e., the director) reported that the Information and Technology Board committee of the facility did not require the researcher to present, making it possible for the study to move forward. The site approval letter and Informed Consent form was returned on April 7, 2019 and was sent via email.

Due to nature of the school and the school calendar, the pilot interview was scheduled for May 10, 2019. During the pilot interview, the researcher explained every step of the process to verify that interview questions flowed and made sense to the participant. The researcher shared the need of the Informed Consent form, the reasoning for recording the interview, and shared that it would be transcribed. It was shared that the confidentiality and privacy would be handled by the researcher and that the participant would have an opportunity to review the transcription prior to it being used for the data analysis process.

The pilot participant interview took approximately 56 minutes in total with the recorded portion of the interview lasting 32:24 minutes long. The audio files were

transcribed and reviewed with the participant for validation. The pilot participant indicated that the researcher needed to dig a little more into pre-service training and the amount of different exposure SLPs have had to different symbol systems. Based on the results of the pilot interview and identifying the importance of the language system, the interview protocol was revised to include an additional question on SLP symbol training and to capture exposure to different symbol systems.

No significant problems were encountered during the recruitment of the pilot participant and the completion of the interview process. The pilot participant was asked to provide feedback on the structure of the interview and how it was conducted. She expressed that the flow of questions was easy to follow and understand and that throughout the process she felt comfortable. Afterwards, the pilot participant discussed with the researcher the next steps to recruiting participants for the study from the facility. The researcher took notes of her feedback and believed the interview process with the pilot participant was a success.

Recruitment of Participants and Obtaining Consent

The researcher focused on recruiting participants who work primarily with individuals diagnosed with ASD. Creswell, Hanson, Clark, & Morales (2007) recommended interviewing 5-25 participants; however, Smith, Flowers, and Larkin (2009) recommended five to eight participants because it allows the researcher the opportunity to obtain enough data within the different environments to gain various perspectives on experiences. To better understand the experiences lived by the SLPs, the

pilot participant assisted the researcher with the selection of participants for the study by reaching out to the lead SLP at the facility and asking for volunteers willing to participate.

The pilot participant reached out to the lead SLP and shared information about the study. The criteria to identify potential participants for the study were as followed: they must hold a license as a Speech Language Pathologist, have experience with individuals diagnosed with ASD, and have experience setting up an AAC device for an individual diagnosed with ASD.

The pilot recruited participants and the lead SLP arranged the interview protocol for the facility. Within a 7-day timeframe, five participants responded, one participant declined, and six participants did not respond to the invitation from the lead SLP. The lead SLP reached out to the researcher and shared that the interviews would take place on June 13 and 14, 2019. One participant was not able to participate during the scheduled time and had to reschedule for the following week. The study sample included SLPs with extensive background in speech language pathology and work experience with individuals diagnosed with ASD. The participants consisted of five SLPs employed at a K-12 therapy center for individuals diagnosed with ASD.

Data Collection

General steps for data collection that utilized the use of semi-structured interviews, and an interview protocol were followed by the researcher. An interview protocol was used that consisted of a series of questions to help the researcher build

rapport with the participants, keep the conversation on track, and capture their descriptions of their lived experiences working with AAC devices and individuals diagnosed with ASD, as well as being helpful in facilitating conversational dialogue and for sharing the thoughts and experiences of the SLPs (Smith et al., 2009).

Interview Process, Setting, and Instrumentation

Interview Process and Setting

The interview process was conducted on-site in the workplace of the participants, which allowed the SLPs to feel more comfortable and willing to share their experiences. Each interview began with a short conversation intended to welcome the participant to the interview and to help establish rapport and comfort with the researcher during the interview process. The purpose of the study was explained, and the researcher addressed any questions raised by the participants. Informed consent was obtained, the interview protocol was shared, and assurance given that participants could stop the interview at any time. The interviews were conducted in an office on-site, so that the school day would not be interrupted. Once the researcher and the participant were ready to begin the interview, the researcher started the audio recording.

The Interview protocol lists the ten questions of the interview protocol used in the research. Questions one through three of the interview protocol, “What is your job title?; Please describe the school?; Could you briefly summarize what your job responsibilities?,” were general open-ended questions that provided the opportunity for the participant to give descriptive feedback (Smith et al., 2009). The remaining questions

were designed to provoke responses to answer the research question: “What factors are considered by SLPs when selecting icons on AAC devices?” The primary objective of the interviews was to speak with the interviewees and discuss their experiences with selecting symbols to use on AAC devices with individuals diagnosed with ASD. The researcher used as little prompting as possible to obtain the most natural of responses from participants (Smith, Jarman, & Osborn, 2008, p. 61). The interviewer was cautious during the interview to not provide the participants with too much prompting or interruptions; however, there were times when a prompt from the interviewer was needed to guide the participant to provide more detailed responses.

Instrumentation

As the was interview conducted, open-ended questions were used to obtain information about the lived experiences of SLPs with AAC devices (Smith, Flowers, & Larkin, 2009). The questions presented made up a part of an interview protocol that allowed the SLP to describe their knowledge level of AAC devices as they relate to individuals with ASD. Given the known characteristics of ASD, it was imperative to the study that the SLP was able to freely express how they select symbols when setting up a device. The following is the full interview protocol.

Interview Protocol

I am going to begin by following an interview protocol that contains a list of questions. It will guide us through the research topics. There is a possibility that we will divert away from the schedule questions, which is anticipated during the interview. I would like to encourage you to give as much detail as you feel comfortable sharing. If you do not wish to answer a question, simply tell me and we will move on.

1. Can you summarize your experience as an SLP?
2. Could you briefly describe your job responsibilities and what you do?
3. Please describe your experience working with individuals diagnosed with Autism Spectrum Disorder (ASD).
4. How much training have you had with graphic symbols?
5. What specialized training have you had in symbol selection for individuals with ASD?
6. What exposure have you had to different symbol systems?
7. How do you determine if the individual diagnosed with ASD can use a graphic symbol?
8. Describe when to use graphic symbols with individuals with ASD?
9. How do you decide what symbol to use on an AAC device? Or across multiple devices?
10. What factors influence your selection of symbols on AAC devices when working with individuals with ASD?

Data Analysis

Transcription

The digital transcriptions of the interviews were produced by TranscribeMe! A company that manages all types of content that processes data compliant with HIPAA, General Data Protection Regulation, as well as content that contains personally identifiable information in San Francisco, California. The transcribed interviews were formatted to reflect the conversation as it happened in real-time, distinguishing between the researcher's questions or comments and the participant's responses to the questions. The time for the turnaround on the transcriptions was anywhere from two to five days totaling $319.24. The researcher reviewed the recordings and reviewed the transcript with the participants to confirm accuracy. The average response time of the participants to the questions given from the interview guide was between 5-10 minutes of continuous speech. Their responses needed to be organized into smaller sections to make the conversation more understandable. Each transcription was separated into sections that corresponded with the questions in the interview guide and headers were added to the transcriptions to make the sections more noticeable. This allowed for the researcher to efficiently connect the data to the interview questions as they were being analyzed.

Initial Coding

After re-reading the transcripts several times, the researcher began to perform initial coding of the interviews and identify ways the participants described their experiences with AAC devices and symbol selection. Using a clean version of the transcripts, the researcher was able to write initial thoughts about potential themes that may present themselves as it relates to the research question. The transcribed interviews allowed for notes to be made that helped the researcher understand the content of what was being shared to capture the emergent themes as suggested by (Smith et al., 2009, p. 65-74):

1. *Reading and re-reading*-read over the interview and annotate information in the left margin.
2. *Notation*-make note of the comments made by the interviewee and what the information means based on what was shared.
3. *Tracking emergent themes*-use the right margin to make note of common threads of thought and begin to create formal statements that illustrate the emergent themes.
4. *Make connections of emergent themes*-begin to connect the themes that have been discovered through the conversations.
5. *Proceed to the next interview*-repeat the process through the remaining interviews and continue to highlight the emergent themes throughout the conversations.

6. *Look for the patterns*-make note of any themes that seem to repeat themselves or any ideas that help bring attention to bigger themes.

Development of Emerging Themes

Emerging themes were grouped together with mapping data that appeared to have a connection using the NVivo software to code the data from the transcriptions, indicating that it may be useful for researchers to group data around items that have meaning and significance to the study (Larkin & Thompson; 2012; Smith et al., 2009, p. 70-72). In the essence of developing themes, Smith et al. (2009) indicated that there may be an overlap in clusters of data depending on the nature of the responses provided by the participants and proposed that the researcher investigate the various clusters and develop central themes.

Connection Across Themes

The core of qualitative data analysis is to identify and classify the data into codes or categories, resulting in a detailed description of what the researcher interprets (Creswell & Poth, 2016). After emergent themes were identified, the researcher combined the themes together and focused on how to structure the data that recognized the most important aspects of the participant's experience with the themes assembled in order of importance to help maintain focus (Smith et al., 2009).

Moving Case-by-Case

As the researcher reviewed the individual transcripts on a case-by-case basis, it was important for the ideas that emerged from the first analysis to be bracketed together with the next analysis. This process allowed the researcher to remain open to the idea that new themes may develop as the data continues to be examined (Smith et al., 2009).

Patterns Across Cases

It was important for the researcher to continue to look for patterns across cases to help move to a more theoretical view of analysis upon the completion of analyzing each interview (Smith et al., 2009). The researcher created a diagram of the emergent themes to help identify connections across the interviews and determine which themes were most prominent (Smith et al., 2009). In addition, the researcher compiled a table to acknowledge super-ordinate themes for each participant (Smith et al., 2009). A composite summary also served as an overall reflection on the emergent themes (Larkin & Thompson, 2012).

Format for Presentation of Results

Consistent with the qualitative approach of IPA, a narrative format was used to share the results of the analysis. The researcher provided a thorough explanation of each interview to help articulate the emergent themes. Quotes from participants are presented to support the themes drawn from the analysis. Lastly, the results focused on providing information that would be useful for the reader to understand core experiences of the SLPs that emerged in the study.

Quality Control

Internal and External Validity

Weiss (1995) suggested the need to conduct a pilot study and the importance of it in the research process. To achieve internal validity, Weiss stated that a pilot study helps the researcher focus on the questions and solidify the process, specifically, showing that in the early stage of research, they are sensitive to the process (Smith et al. 1999). The pilot study allowed the researcher to establish quality control, validity, and reliability of the study based on principles developed by Yardley (2000). The principles of IPA research addressed: 1) sensitivity to context, 2) commitment to rigor, 3) transparency, and 4) impact and importance of the research. The pilot study allowed for reduction or removal of any bias that may be present. The pilot study also enabled the researcher to test the questions for clarity, determine how much time is needed to conduct the interview and to solidify the flow of the interview protocol. Weiss recommended to involve three participants in the pilot study; however, one pilot participant used for this study allowed the researcher to determine if the study was adequate for research. After each interview, all transcripts were reviewed to confirm the data and the interview protocol was updated and modified accordingly.

The researcher remained close to the formal methods of IPA throughout the pilot study. At one point during the data analysis, the researcher began to conduct a micro-analysis of the super-ordinate themes and realized that some themes were closely related. The themes were consolidated to avoid redundancy.

The researcher conducted quality control by reading through transcripts over several days before beginning the coding process. The voice recordings were reviewed by the researcher several times to audit the transcribed interviews. An audit was performed to clean up the data, fill in any missing context, and verify transcribed statements that were inconsistent with the text.

Reflexive Bracketing and Journaling

Reflexive bracketing is a key component of phenomenological research as it helps the researcher place common sense and scientific knowledge about the phenomena to arrive at an unbiased description of the phenomena. Reflexive bracketing also allows for themes to be identified and for the researcher to maintain the integrity of the participant's experience while also enabling reflection on the researcher's interpretation of the meaning of the participant's experience (Smith, Flowers, & Larkin, 2009). Throughout the interview, the research ensured that the conversations were appropriate so that the targeted information was shared, while allowing for clarification of the meaning of the participant's statements.

The researcher has some experience with AAC devices, which is insignificant when conducting an IPA study. Given the nature of speech language pathology, the complex nature of AAC devices, and the overall role an SLP plays in the implementation and instruction of these devices to individuals diagnosed with ASD, the researcher felt it necessary to prepare to be an active listener in the process because of prior knowledge.

The distinction of having prior exposure to AAC devices was important to transcend possible barriers to the study.

The study of AAC devices used with individuals diagnosed with ASD was selected to gain a better understanding of what factors were used by SLPs when establishing the initial setup of an AAC device. When viewing an AAC device, the selection of symbols used appeared to be random and lacked consideration of the user's needs or abilities. Part of the researcher's process for understanding the phenomenon was to discover what challenges and considerations SLPs faced when establishing an AAC device for individuals diagnosed with ASD and to provide recommendations for future decision support.

Ethical Considerations and IRB Compliance

The researcher took every step to ensure the confidentiality of all participants involved in the study and followed all Institutional Review Board (IRB) protocols and mandates. The informed consent procedure provided by the Office for Human Research Protections (OHRP) and the Nova Southeastern University IRB was approved for this study.

To ensure the confidentiality of the participants, the researcher used pseudonyms to represent the participants during the interviews (Smith et al., 2009). All data collected was secured on a password protected computer and the consent forms with the full names of the participants were kept in a locked file cabinet available to the researcher only. Upon completion of the study, all materials pertaining to this research were secured in a

safe location only accessible by the researcher. After three years, all documents and data would be destroyed promptly according to IRB guidelines (Smith et al., 2009). All information in this study was held confidential unless disclosure is required by law. The IRB at Nova Southeastern University and Dr. Laurie Dringus, dissertation chair, would review research records.

Resources and Feasibility

The researcher had access to the resources needed to complete this study. To reduce disruption to the school schedule of the SLPs, the researcher completed the interviews in two days. The researcher interviewed the SLPs at the Haugland Therapy Services facility in Dublin, Ohio.

The NVivo software was utilized to store, organize, and sort the data files. The researcher also conducted an online search for a reputable company that focused on transcribing recordings for the purpose of research use to transcribe interviews into resource files for the purpose of coding, analysis of the interviews, and to help identify emergent themes. A company that fit these four criteria: security, accuracy, turnaround time, and price was selected.

Summary

In this chapter, the specific plan for the implementation of this IPA study has been defined. The researcher described the selection criteria for SLPs who participated in the semi-structured interviews, the process for the transcription of data, and the process for coding and analysis of data for emerging and subordinate themes. Throughout the stages

of the study, the researcher was aware of biases and personal experiences that could potentially bring negative or unintended consequences to the outcomes of the study. The researcher conducted the interviews with the highest level of ethical intent and participation consideration.

Chapter 4

Results

The researcher explored the lived experiences of the speech language pathologist when selecting symbols on AAC devices. Belani (2012) explained SLPs provide a critical role in the mediation between AAC devices and the symbol selection for individual users with ASD. The IPA methodology afforded the researcher to understand what factors influenced symbol selection and decisions made by SLPs. The intended outcome of the research is to provide SLPs with guidelines on selecting symbols for AAC devices and improved usability of the devices for individuals with autism. As such, the researcher developed the following research question:

What factors were considered by SLPs when selecting icons on AAC devices?

Data Analysis

To answer the research question, the researcher conducted interviews. Interview data were analyzed through the researcher's manual coding and using NVivo10 qualitative analysis software. The objective was to establish common themes related to the factors SLPs consider when selecting icons on AAC devices. In keeping with IPA methodology, the researcher first read the interview transcripts and made annotations on emergent themes. Then the researcher highlighted or "coded" quotes, words, and passages relevant to the research question and established general patterns from the content. The researcher then evaluated the codes to determine whether they could fit into

larger thematic categories. When all codes were positioned into larger categories, the researcher assessed their relationships among the categories, with the intent to determine overarching superordinate themes and subordinate themes that accurately reflected the data. The final narrative offered in the present chapter included quotes from the participants, using participant pseudonyms with no identifying information attached to the interviewee.

The results created three superordinate themes related to Customizing for Usability and Iconicity, External Influences, and Learning as You Go. SLPs exhibited a sustained interest in making sure the symbols were personalized to individual student needs. This meant tailoring to students' abilities, offering accurate iconicity, and providing icons that were motivating in students' everyday lives to engage learner interests. SLPs did not make decisions in a vacuum. Other stakeholders and entities influenced the clinicians such as software manufacturers and apps, representatives and trainings, the funding and insurance structure associated with particular devices, and members of the AAC Technology Team like parents and teachers. Together these external factors structured how SLPs determined which icons and devices to use. With a lack of specialized training in symbol selection, SLPs formulated most of their decisions based on the job training that tapped into qualities like flexibility and building progress incrementally through reinforcement. In doing so, the clinicians relied on trial and error.

Superordinate Theme 1: Customizing for Iconicity and Usability

Iconicity and usability influenced SLP's symbol selection on AAC devices. The findings reinforced prior research that found iconicity was a factor in symbol selection (Hartley and Allen, 2013; Pampoulou, 2017). All five SLPs expressed the influence of usability and iconicity on symbol selection and how essential it was to implement on the AAC devices. In particular, SLPs were concerned with customizing icons on devices that were most effective for the individual. The superordinate theme produced three subordinate themes: tailoring to the individual and their ability, offering accurate iconicity, and providing icons that were motivating in students' everyday lives.

Subordinate Theme 1a: Tailoring to the Individual and Their Ability

Respondents often discussed individuality and patient particularity as factors for selecting icons as well as plans of care more generally. Clinicians had to gain experience with the student themselves to understand their interests before making subsequent decisions regarding symbol selection. This finding was summarized by comments like: "Ultimately, it's what's the best fit for the student, like usability, kind of what they adapt best to" (Carolyn). SLPs had to try the systems to determine usability for each student.

An individual's ability level was of particular concern. Wobbrock, Gajos, Harada, and Froehlich (2011) stress the importance of individualization in ASD treatment. Students come to SLP therapy centers with varying needs and ability levels. Some may have prior experience with devices and others might have specialized needs that directly impact the treatment plan. That is why SLPs must take a holistic approach tailored to the

individual's ability when considering symbols. Carolyn elaborated on how she customizes according to ability level:

> The main difference is just there's a wide range of ability, so I think you just have to really look at the individual student and see where they're at and where you kind of need to start. Some of my students are completely nonverbal. I might go more the route of functional communication, getting them to even notice you're in the room and communicate with you. Then maybe moving towards a communication device. Whereas, I might have another student who might be in high school and is just kind of honing in on those social skills, trying to relate to other students in their class and things like that. So, I think it's such a wide range that you just kind of have to be mindful of the current student and where they're at (Carolyn).

Based on the student's ability, the SLP determines an appropriate starting point. A nonverbal student requires a radically different approach than a communicative student with prior therapy and AAC experience. The goal was to assess the client's unique ability before considering symbol selection.

Another point of concern was customizing the symbols for applicability to the student's life. Some devices lend themselves to high degrees of customization whereas others have minimal opportunities for customization, as will be elaborated in more

detail in superordinate theme two. Referring to her experience with Proloquo, Josephine remarked that the device lends itself to customization based on the individual student's needs:

> When I first opened it up and used it with a student, it asked me to decide how many icons I put on the front page. I can decide for the student, depending on whether they're kind of a first-time learner or if they've been doing it for a while, how many buttons I want them to have access to, and then really, I think to me, it seems the goal of Proloquo is just for you to completely customize it for the student. So, I tend to make sure I have buttons available for students like their personal information is a button on the first front page. So, if you click on it, you can say, 'Hi, my name's Philly. I live in so and so place,' and then I'll have pictures of their family members on there and say, the mom's name is Joanne. So Proloquo, I think, lends itself to be more customizable with pictures and changing the icons and everything because I think it was designed that way that you would customize everything to the student.

SLPs must consider whether the device and symbols fit seamlessly with the student's life and needs. This factor is highlighting their concern with usability. They often gain more insight on students' activities outside of therapy and what symbols might be most helpful in their everyday lives. The SLP favors a system like Proloquo

that has buttons available to customize the student's personal information. Josephine offered more specific details on how she adapted a device for a practical application based on an individual student's needs:

> I definitely try to think about our students here too, and again, what'd be functional for them outside of school. I have one student. He uses PRC LAMP, which is pretty set, but under his food page, we have specific orders that he likes at different restaurants because to him and to his family that's really important that he can order his cheeseburger with fries and a diet coke. So that's customized in itself because that was something that mom had requested and that he really likes doing, and he loves going to Wendy's.

Josephine determined that this student's food and restaurant preferences should be programed into the device to facilitate ordering particular food items. When they visited the restaurant, he and his family could easily select a particular icon representing the desired food items. The goal was to take an inventory of the student's needs and lifestyle. In this way, SLPs are customizing the icons to the individual client for usability.

Subordinate Theme 1b: Accurate Iconicity

Most clinicians aimed for representative iconicity to enhance device usability. For many SLPs, vivid iconicity was a leading factor determining symbol selection. They preferred when the symbols had the most realistic pictures reflecting the student's everyday experiences. This finding supports Sampath, Agarwal, and Idurkhya's (2013) research suggesting that detailed display enhanced device usability for individuals with ASD.

The clinicians shared the significance of clients understanding the icons to achieve usability. They agreed that clear images facilitated recognition and understanding. In most cases, if students see an icon representing a real-world object, it is easier for them to understand that connection. SLPs determine whether a student works best with specific real-life symbols or more abstract motor planning systems during the trial period. They must adapt to the individual student's need. Abigail, Allison, and Carolyn summarized the influence of iconicity on their symbol selection through examples:

> If I see a frog in real life, and I want to identify it on my device, I'm going to look for a frog, something that looks similar to that instead of, I don't know, a circle. So, I think that that would help our kids more. If deciding on symbol selection, I try to pick something that's similar to that thing (Abigail).

> A lot of that comes down to the trial with the specific kid. For kids who are very, I guess, a little more rigid and need more real-life symbols, I'm not going to use LAMP because their pictures—their symbols are a little—some of them just are a little more abstract (Allison).

> I think an icon that clearly represented a real-life item is when they understand. They use the symbol effectively and they understand it. It allows them to communicate the things that they want or need … they have an easier time with more concrete symbols (Carolyn).

The passages above illustrate how clinicians often execute decisions based on vivid, real-life symbols. The symbols are also aimed to connect with a child's personal characteristics. Much of the selection process involves what motivates the student to engage. Maya explained how attention to student interests impacts her symbol selection and thus the student's ability to engage with the language system: "I just see what the kid is more receptive to and what they're more drawn to. That's usually the way I go about it." Often students are motivated by food preferences. A student might not be interested in a frog, as in Abigail's example, but odds are they will be drawn to particular foods that they would like to enjoy. For this reason, SLPs often used photographs of desirable food objects to motivate their clients. The following quotes

demonstrate how clinicians provide images of the client's favorite foods for AAC symbols:

> What I'll do is take pictures of the objects. Like, I have a kid who -- he likes different kinds of chips, and they don't really have symbols for different Doritos. So, I just take a picture. And the real picture he can understand. Because if I'm holding them up, he's like, 'Oh, I want that one.' And he can kind of match that (Maya).

> I think they have an easier time with the more concrete symbols, like for snacks. A lot of my kids are motivated by snacks. If they see a cookie or something, they're probably more drawn to that rather than something more abstract (Carolyn).

> I'm definitely more apt to change nouns, pictures that are highly motivating for students because the word Chips on there may not be very motivating, but if I have a picture of Takis, which I don't know if it's an autism thing or if it's a Haugland Learning Center thing. Our kids love Takis and Hot Cheetos. That's their favorite snack. I don't know why. They stink. They're spicy, whatever, but our kids love them. So, if I get a picture of Takis on there or I could make a button specifically for Takis, but if that picture is more motivating than the

> weird, yellow Lays crisp, then yeah, that's definitely something that's editable (Josephine).

Selecting and photographing highly motivating icons that accurately represent a real-life object is key for most students, but not all. Students who lean on motor planning are less concerned with the accurate iconicity of the symbol. For instance, Allison explained that LAMP was a program geared towards motor planning. She divulged, “when we trial LAMP, the symbols really don't matter as much. It's more the motor plan of this is where eat is.” Allison provided a specific example to clarify her point. One of her students displayed successful progress through motor planning during initial trials, which alerted Allison to try a motor plan device that employed more abstract symbols. “I have one kid that doesn't even look at her device. She just knows where everything is.” Concrete icons would not be appropriate for that student in this case.

If a student works better with a motor planning setup, the SLP must focus on the placement of buttons and icons on the device. This can sometimes be a tedious process because there may be a wide range of buttons and options on the device. It depends on the design of the device and the SLP to determine key positioning in this case. Maya discussed how the motor planning function worked:

> You want them to learn where things are because you have to teach them every part. So, if I said, ‘Hey, what do you want to eat?’ I'm not just going to give it. I

> have to show them where it is. The premise of LAMP is that they learn that motor plan of, 'Oh, I hit eat, and then I go here to get snacks.'

As with the other SLPs, Maya is tailoring the treatment and icons to the particular individual's language program. Motor planning students tend to work on LAMP. However, she still works on the desire and reward aspects of the device. Through repetition, Maya demonstrates the cause and effect of certain actions. Hitting the eat button in a particular location on the device produces a determined result, whether in communication or in the clinician producing a snack to consume.

Subordinate Theme 1C: Motivation

SLPs frequently discussed how the iconicity related to how a particular icon represented something motivating to the individual. Students needed to be invested in the device itself. It needed to provide some identifiable benefit. That meant providing symbols that elicited desired results. SLPs established this association through repetition with personalized items. The clinicians explained how they factored in highly motivating icons in symbol selection:

> It's so important to have pictures and icons and words on their device that are motivating for them and that are part of their everyday functional because that's going to give-- that's it's going to get buy in to the device. So, if you throw it-- you can't put a device in front of a kid and say, 'Use it' (Josephine).

I think since they are used to seeing that thing in real life, it might be easier for them to see it and associate, ‘That's exactly the thing that I want,’ and easier for them to select it (Abigail).

We use motivating items, so the student can start to understand like, "Oh. I say this. I use the symbol. I get this," kind of thing (Carolyn).

A lot of times when we start a kid with a device, we'll use those highly motivating items. Because at first you really just want them to realize like, "Oh, I can use this to get what I want for communication." You're not really teaching symbols but you're just teaching, ‘Oh, this is to communicate. This is how I use this device." And then once they get the hang of that and realize, "Oh, I don't have to cry. I can just push this button and I'll get something.’ And once they realize that this is to help them communicate, then we'll add a little more of the symbols and pictures and kind of focusing on ways that my first do I start more on that core vocab like eat, play, want. Just with those highly reinforcing items to get them to like I said, use the device. And we'll do that usually with at least two different symbol systems, and whichever one they're making more progress on is usually the one we'll use (Allison).

SLPs made sure that the individual used the device and understood the purpose of using the device to communicate with others. They cemented usability by offering icons that represented things that the individual wanted. Through repeated use, the training demonstrated to the students the causal relationship between the icon and a direct reaction.

Superordinate Theme 2: External Influences

The second superordinate theme was External Influences. Five out of five respondents contributed to the finding. SLPs were impacted by several outside elements, even if they were fully conscious of their control on their treatment decisions. The subordinate themes that developed the superordinate theme were influence from software and app developers, device manufacturer representatives and trainings, funding sources, and other facilitators. These elements structure how SLP's individual decisions are formulated. Moreover, any of these external elements can affect subsequent decisions, which necessitates SLP's consideration for each one as they form the holistic environment in which symbol selections occur.

Subordinate Theme 2a: Influence from Software and App Developers

Software and app developers were perhaps the greatest external factor affecting SLP's symbol selection. All five respondents remarked on the importance of software and apps developers in determining their symbol selection. Due to the nature of these devices, they are embedded with their own language system that dictates what symbol set can be used. This control of the language and symbols varied according to device.

Although there has been a marked expansion of programs lately, SLPs relied on three primary devices. When asked whether devices contribute to symbol selection, Josephine explained:

> It definitely makes a difference because the three main types of devices we use, the Tobii, PRC, and the Proloquo2Go, have pretty much set pictures that they use. Either stick pictures or the Proloquo2Go uses stick figures for their different actions and things that they do. And Tobii is similar. That's like stick figures doing different actions and things like that. They're actually pretty similar. There are tons of [inaudible] which is interesting. And then the LAMP ones, again, apparently, there's research out there for why they picked the pictures that they did. I don't know if you have all the time in the world to read it. I haven't read it yet, but apparently there's a choice for all the words that they picked. So, I think that makes a difference when you're deciding on a language system for a trial.

Josephine highlighted the ways devices can bind SLPs into a particular language system and impact symbol selection. She pointed out that they primarily use three types of devices: Tobii, PRC, and Proloquo2Go. Allison and Abigail concurred with Josephine. Allison disclosed, “Like the symbol selection itself, certainly, the manufacturers of those devices, that's going to influence you to select these symbols versus those symbols.” Abigail also noted rigidity in device programming. She shared, “Well, a lot of them come just pre-programmed with the symbols through the manufacturer. So, I kind of just run with what I'm given.”

As Josephine mentioned, Language Acquisition through Motor Planning (LAMP) offers the highest degree of standardization. LAMP's goal is to tap into and strengthen a student's motor planning. Carolyn suggested that once you know what language system best suited a client, such as LAMP for a motor planning student, that limits the device options: "LAMP is really interesting because it's one board kind of fits all. You can't really change that board. So do they benefit more from a motor approach that would support the symbols, or with Proloquo, do they benefit more with bigger symbols, maybe, that aren't as hard to navigate?" Finally, Maya shared there are fewer options for LAMP: "For LAMP, you don't pick the symbols, really. It's preset. So, you don't really select anything except for what we call fringe vocabulary." These comments highlight the importance of devices for narrowing potential symbol selection choices. Students more apt to succeed on motor planning language systems will likely be paired with LAMP, which comes largely preset.

The number of apps options was a different story. SLPs explained that apps provided endless choices, perhaps to a fault. Some clinicians shared that they were overwhelmed with the number of options apps provided. This finding echoes Pampoulou and Fuller (2020) claim that variation creates challenges. Josephine reflected on what it is like to choose from so many options:

> I think that's definitely a challenge with just the number of apps that are out there and then the lack of research on the apps themselves. I mean, companies like Tobii appears to have made apps for iPads using their language system, but then

> there's also Proloquo, and there's TouchChat, and there are all these different kinds that are out there and so trying to decide for a student what the right choice is especially when they come in without any language system, if they come in completely non-verbal, never touched a device in their life, and I have to try to make a decision as to which one I think is best for them, that's challenging.

Due to the sheer number of apps available to clients and providers, SLPs struggle to weed though which app is the right fit for their clients. In the context of discussing the explosion of apps available, it was stressful to determine which apps are backed by evidence-based data, as well. Allison shared Josephine's stance on apps. While some of her clients were already set on a particular program, necessitating little decision making in terms of language, transitioning students prompted more decisions on apps: "Definitely for some of our kiddos, maybe if they're on Picture Exchange and you're like, 'Okay, they can move up to a device.' It is really hard because there are so many options." The volume of apps could cloud one's decision process.

On the other hand, SLPs can make adjustments on devices to enhance usability. These features are particularly useful for clients with certain impairments like impaired vision. Tinkering with background color, font, number and size of keys can alter a client's ability to benefit from the device. When asked to specify what kinds of alterations she made to devices and apps, Josephine shared: "Some of our kids might have visual impairment, so keeping any contrasting colors if needed. Some of our systems let you do that. I change the background color or find a picture of an icon that's

really contrasting colors." Allison expressed that "If you need to change the icon you can edit everything," although that was not a major concern with her current caseload. She explained, "With my kids I haven't noticed the icons being too much of an issue or the symbols being an issue. But some of our kids, it's easier for them to have a black background versus a white just because things pop more. It helps them be able to focus." Abigail noted the various alterations in further detail:

> There are sometimes talk about the background of it, some that need the darker background with the lighter picture or vice versa. And even I think on the dedicated devices, but more so I've seen on the app how you can change, especially when you're just starting out and have just a few selected words on the device. Usually, the background of everything is white. Even the blank keys that are hiding, but you're able to also make the blank keys darker and then the other keys - I'll show you - that are not hidden are actually still white and kind of stick out more.

In addition to color changes, SLPs could adjust the number of buttons on the device or their size. The goal of these alterations was to increase ease of use for the individual client, particularly those with visual impairments. These features provided added contrast and an extra pop to clarify what students see on the screen. If one was working with a visually impaired client, it seems likely that selecting a device and language system with that functionality would be critical, and therefore alter what symbols were available for clinicians to select.

Subordinate Theme 2b: Device Manufacturer Representatives and Training

Representatives of device manufacturers who interact with SLPs and affiliated clinics also impacted symbol selection. The participants shared that the device companies utilize their own staff of SLPs to help develop symbols for use in a variety of settings. Part of the role of the sales representatives is to spend a great amount of time traveling to schools to offer professional development and support to SLPs in hopes of influencing a school to select their system as the primary device. In this environment, one company invests a great amount of time visiting staff and providing support on their device. Thus, the device representatives themselves can influence which devices and symbols SLPs choose. The SLPs referred to multiple companies:

> We talked a lot about PECS or just using low-tech choice boards, that kind of stuff. I also had people come in from PRC to talk about LAMP and we had someone come in and talk about them from Tobii DynaVox (Allison).
>
> I've gone to two trainings for two different AAC companies and basically, they teach you how to use the device, but they also teach you about symbols too. Kind of a refresher as like, it's a good idea to put certain colors behind certain symbols. That kind of thing. I went to a training for PRC, which is the LAMP, and then I went to one for Tobii DynaVox. They pretty much said the same things, just a different format (Maya).

> I had the most experience with PRC and Tobii DynaVox here because of their research base and their presence here and by having representatives, it's helpful to have someone come in and show me how to use it and show me why it's successful (Josephine).

> We've had a lot of training here. We just had one this morning with a device rep that came in and was teaching us some new software (Carolyn).

Respondents explained that representatives from device manufacturing companies facilitated their learning and device selection process. They shared that these agents were helpful in illuminating the positive attributes for each device and to explain general functions. These representatives provided valuable insight into the functions of each device. With a relatively small number of companies and apps listed—Tobii DynaVox, PRC, and LAMP—these influences had a sizeable impact on their decisions.

In addition, SLP's varying exposure to certain systems in graduate programs and regional settings can impact their decisions. While most of the respondents earned their training experience in Ohio, there are even regional differences and variation in graduate programs. Josephine best depicted these points:

> It's funny. I wish they had a map of usage of different apps in different parts of the country because I've talked to one of our reps before that said parts of Ohio

like different apps. One part of Ohio likes Proloquo. Another part of Ohio kind of likes TouchChat.

It kind of just depends on where you are, but I think that has a lot to do with the exposure you get in grad school or in the placements that you're in. If you're in a school where they primarily use Proloquo and then you gain a grad student and you teach them about Proloquo, they may go and use Proloquo. I think it just depends, and I think that's what's hard as a speech therapist to do your due diligence and not just go with what you've been taught or what you've been shown but try to expand into all these different apps to make sure you make the right decision. But yeah, I think it depends, sometimes location wise. Like I've said before, we really like PRC and Toby here, but we've had more exposure to them, and they've made their presence known.

Josephine's comments allude to the ways SLP exposure to certain devices, including regional preferences, contributes to a domino effect in decision-making. One's location can determine whether they prefer Proloquo or TouchChat, which in turn affects which symbols are available to the client. In these ways, SLP's exposure to different devices and systems, whether through interactions with representatives or trainings, can alter their preference for certain options.

Subordinate Theme 2c: Funding Sources

Funding sources, trial periods, and insurance plans were additional external influences that impacted SLP's symbol selection. Each student came to the treatment with different sources of income and were aligned with separate insurance companies with varying limits on trial periods. SLPs were confined to choosing a device, and therefore the symbols allowed on that device, within the parameters set by those factors.

> Depending on their funding sources, it gets complicated. Usually with Medicaid, as long as you have the evidence supporting this trial period that you did with the kid-- I can't remember what the time length is, but you trial a few different devices with the kid. If you saw that they picked up on one over another, and then you think that they would definitely benefit from using that within their educational environment at home, then you go through and go through the process of requesting funding for that device. If they have Medicaid, and they get the sign off from their doctor, then usually, that process happens a lot quicker, and they don't have to go through a trial period with that. That evaluation process with the device is kind of considered their trial. And then if it's a private insurance funded device, then that's where you have a little bit more time to have an experience with the device. So, I have a kid right now that's doing his trial period with a dedicated device for a LAMP because they have it funded through private

> insurance. And so, it's a 3-month trial period or 12-week trial period, and then you have to send in an addendum and tell them, 'This is how the kid did over the course of these 12 weeks, and this is why they really do need this device to meet their medical needs' (Abigail).

> I think it's just their overall ability because with an AAC device, it's just such a big decision because they're so expensive, they only get one every five years due to insurance, so I think you just want to make sure they're really ready to get it, and that might be a student who you give them two PECS symbols and they're still not really able to move past that (Carolyn).

> Medicaid has certain requirements, you have to trial three devices and stuff, and you have to be able to explain why you picked this system and not the other ones and have a paragraph for each one (Allison).

SLPs had the unique responsibility of choosing a device suited for their client. This was an important decision because the student would work with the device for long periods of time, typically five years. The SLPs disclosed that due to that time commitment and the high cost of these devices, insurance companies required explanations as to why the SLPs chose particular devices. Within that explanation, SLPs must include relevant information such as what students accomplished on each of their

trial devices. For instance, they were to include comments such as, “They could do this many times. They can use this many words” (Allison). They were also required to provide data comparing student successes on their trial devices.

Interestingly, funding comes into play when SLPs make device durability decisions as well. In learning institutions that specialize in autism, experienced SLPs factor in durability of the device. Carolyn explained:

> If I can get a device for them on a language system on a device that is durable - medical grade equipment is what we call it - funded by their Medicaid, then I'm more likely to want to have that for my student because that device company will give us this durable piece of equipment that they can use, and if it gets knocked over - it may break, it may not - but it's a lot more durable than an iPad … our therapists have worked really hard to get those devices funded so that kids can have a communication device that's going to last through a-- we call them BOC, Behavior of Concern, more than their iPad.

SLPs take their time to do their due diligence when selecting a device because they know the student will likely be tied to that device for an extended time period. Moreover, devices are expensive and insurance companies have constraints. In addition to time limits on trial periods, insurance companies also require specific clinical explanations justifying why SLPs select particular devices. Ultimately, the device they choose will limit symbol selection.

Subordinate Theme 2d: Other Facilitators

Parents and teachers were another key factor in determining symbol selection as well as choosing devices themselves. According to Beukelman et al. (2005), parents and teachers form part of the AAC Technology team. The AAC Technology team is composed of parents and other family members, teachers, caregivers, SLPs, occupational therapists, and other specialists. SLPs welcome input from external influences like parents and teachers because it enhanced device usability and created a positive energy around the client's therapy. The clinicians have limited time with their clients therefore including other AAC Technology team members served to strengthen outcomes. The involvement of these other stakeholders was reflected in comments like "parents definitely have a big say in that … and teachers too" (Josephine). SLPs also reported doing "parent consultation" which might include input on things like putting "pictures of family members" on symbols (Carolyn).

As a collective, SLPs enjoyed outside input from facilitators because it helped them establish a connection with the students and allowed them to tap into certain personalized traits. Josephine admitted that she appreciates parental and teacher involvement because it changes the therapeutic experience. She insisted, "it makes a big difference when teachers are motivated to use the device, and [when] teachers and parents are invested." Josephine recalled an example of how parent involvement allowed her to enhance usability, iconicity, in symbol selection, which would ultimately

streamline the family's dining experience. She reflected on the instance from the parent's perspective:

> He really likes this Blue Mountain Dew. The mother asked, 'Can you please make a button just for Blue Mountain Dew because green won't do. Red won't do either. We need a Blue Mountain Dew icon because that's so specific.' So, I think it depends a lot on the buy in from teachers and parents because they may be pushing for more vocabulary too. I think that makes a difference too for some of our kids. And again, their definition of success too depends because if a parent is really harping on, 'We want verbal speech, verbal speech, verbal speech,' they may be a little more lenient to tell me, 'Well, they can say Blue Mountain Dew. So why don't we add it to the device? So, let's add it anyways because maybe on Tuesday, he decides he doesn't want to talk at all. So, let's put a picture of Blue Mountain Dew on there.' There are a lot of factors, but I think the student's motivation, parent's motivation, what they're doing in the classroom [are key].

Those detailed tidbits from parents and teachers help clinicians structure symbol selection on devices. Parents and teachers have a large say in what symbols are needed for success in everyday life or in the classroom. When prompted about symbol selection, Abigail offered a similar take. The SLP spoke about family providing core motivating factors that determined symbol selection:

> Definitely, family, too. Anything that I need to specialize at the center, like special icons that are here or motivating and the reinforcers that are here, I'll add on. But I definitely always try and get the parents' input on, ‘Is there anything that you want me to add on the device? Does it matter what it is?’ Or I'll do trainings with them and have them be the ones that take the pictures for what they want on their child's device.

The remarks above indicate that teachers, but especially parents, impacted the therapeutic process everywhere from trainings to icon selection. Walking through the process with supporters like parents was crucial to establish confidence with the language, icons, and device among the whole AAC Technology team.

Another way that families factored into symbol selection was the availability of device supports. AAC devices come with support systems. Usually, SLPs are responsible for troubleshooting problems with devices but they were also concerned with providing a safety net for families once their children moved on from their care. Those external tools and even social media communities reassured SLPs that families would have adequate support after their one-on-one therapy ended. The following comments sustain this point:

> A lot of it is the support. I'm much more likely to get a device from a well-known company that can provide support than some unheard of app off the iPad. Because that support is huge. And not just for us but for families, as well. They can go on

Facebook and find a LAMP Words for Life group and ask a question on there and a million people answer it (Allison).

I want [families] to be a part of the whole process and also take some ownership for like, ‘If I'm not there, you're the one that has to be able to do this.’ So yeah, definitely influence by the parents and then the kid, and like you said, the manufacturer. I think those are the main things (Abigail).

They're 19, 20, 22 years old and are aging out. A big positive of the devices that have support is that when they walk away from me, parents have their phone number to call to say ‘Oh, the device is making this weird noise,’ or, ‘It's not talking,’ or, ‘The buttons have been moved, and I don't know what happened.’ They have a system to call to troubleshoot that issue because after they leave here, they don't necessarily get speech therapy. That's not something they're always going to have. So, access to me is limited after they graduate. So, I think when you think of what kind of system you want to give a student, you have to also think about long term, where they're going to go next, and is there support for parents to call? And not to say, ‘I'm not available.’ I've definitely told most all of my parents that are graduating, ‘Please still email me. Please still call me. I'm here.’ But it's really nice when a kid has a PRC device and can call. I sound like I'm a PRC rep, but I'm just really impressed with their support phone line. I call

> them, I think, every day. It's really nice to know that the parents and families are going to be taken care of in terms of support (Josephine).

The comments above illustrate how SLPs go to considerable lengths to include parents and teachers in their decision-making processes. These stakeholders offer valuable insight on what symbols are most relevant to the student's daily lives. They also provide clues that aid clinicians as they formulate the students' overall learning strategy. For this reason, SLPs establish a mutually beneficial relationship by considering ways that those facilitators can be supported such as through choosing devices with strong troubleshooting and social support networks.

Throughout the interview process, the SLPs expressed the major influence that external influences had on their decision to select one over the other. This also impacted the language system that was going to be used with the individual. In general, manufacturers of AAC devices had great influence over SLPs selection of symbols and their choice of device since they control the language on the devices largely due to the funding structure and what was deemed acceptable as a communication device. Representatives held considerable sway over decision-making processes. They were responsible for marketing products in addition to training SLPs. In addition, SLPs exposure to certain devices and training was a factor. Certain devices were more common in regions and where SLPs conducted their graduate training or completed device training with

representatives. Those factors could influence personal preferences for devices. In addition, each device is bound to a complicated funding structure. Those clients without private insurance have less flexibility in choosing devices and SLPs are bound to justify their selection processes in a restricted timeline. Finally, SLPs included other AAC facilitators such as parents and teachers to personalize the learning experience. Parents could request certain symbols be included on the device such as specific meal orders. They could also customize the device with pictures. SLPs found that assessing external influences would further the client's support system down the road.

Superordinate Theme 3: Learning as You Go

Learning as You Go was the third superordinate theme. All five respondents supported this finding. The Learning as You Go finding was supported by four subordinate themes: limited graduate training, trial and error, remaining flexible, and progress through reinforcement. Together, this finding captured how SLPs adapted to client needs through on the go training. For instance, comments like, "That's just how I learn, through experience" (Maya) spoke to the ways SLP's expertise in symbol selection derived from practice. This finding also highlights SLPs' strengths in improvising and creativity while calling attention to the lack of systematic processes for selecting symbols, as identified in the literature.

Subordinate Theme 3a: Limited Graduate Training

SLPs lacked adequate training on symbol selection and AAC devices while in graduate school. They were not given a clear instruction manual, and many felt that their graduate training did not prepare them for the particularities and nuances of symbol selection. Some devices gave little room for customization, so it was up to SLP's instincts to discover which symbols worked best for the client. They compensated for the lack of specialized graduate training by learning on the go.

SLPs were seldom offered more than one AAC device-specific course during their undergraduate and graduate studies if they had the option to take a course at all. They were only offered basic, introductory style courses that did not provide the appropriate degree of technical specificity. None of that education was particularly useful in their current tasks working with AAC devices. The interviewees explained how their limited formal studies directly linked to learning on the go:

> I think I probably could have used more than just one [AAC course], honestly, but then I also had that externship at Monarch, and then here. And so those experiences helped me more than the class did, really (Maya).

> I think in undergrad, everything was very general. It was speech and hearing science, so I feel like I had a really big overview of everything, but I didn't have any training in apps or AAC or the ins and outs of speech pathology. It was more

> just like, ‘Let's learn anatomy,’ like, ‘Let's learn intro to speech pathology.’ So undergrad, I wouldn't say I got a lot of exposure to that. I did have one class in grad school for AAC, and it was kind of helpful. It still wasn't as beneficial, I think, as learning from experience (Carolyn).

> Specialized training for symbol selection? I would probably say none (Abigail).

> Typically, it’s just the system in general. It's not autism specific. Yeah. I've not really had any trainings that have been autism specific with AAC … I wish there would be more trainings on-- not device-specific, but just like a training on how to decide which one to do. Like not have a training on just LAMP or just Tobii, but here is a training on how to decide which program might be best. That, I think, would be very good (Allison).

The SLPs reported similar experiences in their educational training. Respondents agreed that while they may have been introduced to AACs and symbol selection in graduate school, that training would not be enough to sustain their professional work given their current specialization. Undergraduate school provided a broad focus on the basic building blocks of the field. What mattered most was on the job training. The SLPs gained the most expertise through practice.

Subordinate Theme 3b: Trial and Error

SLP's treatment plans vary widely, particularly because there is no systematic training in place. Therefore, SLPs utilized "trial and error" or experimentation to establish the best fit for their clients. They drew on their own instincts, which were sharpened from time accrued with students. The clinicians reported that often their first step in establishing symbol selection is engaging the student with the device and then tweaking everything from there. For example, Maya explained: "The first tool is really to kind of test them, right? And then from there, kind of determine what symbol's effective for them." The clinicians outlined the process of trial and error:

> It's kind of also like a trial. Like, when you meet the person, you trial different programs and you see which one they're more drawn to and which one they're more effective at using. Because there's-- like I said that one kid, he did not respond well to LAMP. He didn't like it at all. So, I tried something else that was a little more picture-based and it worked a lot better. So, it's just kind of trial and error with what they are more drawn to (Maya).

> Especially for a student who's nonverbal, you want to give them as many options as possible to try. It's kind of trial and error (Josephine).

> We try not to change the kid's system, really. The one kid where I did, it was really just he was making no progress on the system he was in. When we trialed both of them, he was actively going to the other one and showing progress. So that's more why we switched over (Allison).

When working with AAC devices for ASD students, there is no one-size-fits all program because there are different variables related to the individual client and the device. Ultimately, it came down to "trial and error" As the clinicians mentioned, SLPs typically try a device with an open mind and then make adjustments once they see how a student responds. The devices and apps exhibit wide variation in languages and symbols therefore experimentation is the best method. There is no way to know what program, language or symbol best suites a client until they gain firsthand experience.

Subordinate Theme 3c: Remaining Flexible

Remaining flexible was an integral component of the Learning as You Go theme. If a student did not respond to a particular approach, the SLP considered it best to reassess and modify. This was especially true in the planning process. While in graduate school, SLPs learned to prepare for each session with a solid plan. Such a practice was considered a mark of professionalism in their discipline's academic training. However, in practice, there was more on the job training that loosened those objectives. Josephine: explained:

> You don't go in with a plan and stick to the plan. It is just the opposite of what they teach you in grad school. They tell you, 'You got to come in with a lesson plan and everything that you want [the client] to learn or everything that you want to teach today.' I don't make lesson plans anymore. I go in with an idea of maybe today, if I'm working with a kid on a device, we want to get them to two and three word sentences. So, I'll kind of pull some activities, but really just kind of going with the flow, what the kid wants to do.

Josephine's experience taught her that concrete plans were senseless because she was constantly learning and adapting. Graduate school teachings focused on planning were not realistic for the daily curveballs on the job. Some practitioners took a slightly more calculated approach and reserved at least basic plans, however. Abigail generally prepared a lesson, but she remained adaptive because "every day is different." She suggested that it was vital for SLPs to maintain an open mind when dealing with treatment plans: "I usually have a plan in place, and if it needs to veer off in another direction due to whatever's going on with that kid that day, then we do that." Like Josephine, Abigail advocated for variation and flexibility in her therapeutic practices, which applies to device selection, lesson plans, and even symbol selection. Ultimately, SLPs must adapt to the students' needs, a skill only gained through learning as you go.

Subordinate Theme 3d: Progress through Reinforcement

While the Learning as You Go superordinate theme demonstrates pronounced flexibility, the SLPs still had benchmarks that indicated when a student was succeeding. Their goal was to establish improvements in communication ability rather than perfection. They maintained obtainable goals before challenging the student to attempt a new challenge. For instance, Carolyn stated that treatment was about, "getting those fundamental skills before you move them up." Moreover, Josephine knew she was on the right path when, "[Clients are] able to be consistent with the words they have before introducing new symbols or introducing new vocabulary words." Abigail also pointed out that it was "Important for students to build their skills incrementally" in relation to symbol selection. She helped demonstrate what that process looks like in practice:

> Once they realize that this is to help them communicate, then we'll add a little more of the symbols and pictures. First, I start more on that core vocab like eat, play, and want. Just with those highly reinforcing items to get them to like I said, use the device.

The SLPs viewed symbol selection as an iterative process. They began by testing out basic language and symbols to establish a solid foundation. Abigail started with reinforcing language that formed the core of a student's language. Many of AAC devices

are adaptable to reduce the number of symbols so as not to overwhelm beginners. Once students demonstrate improvement, SLPs can gradually increase the number and complexity of the symbols on the AAC device.

Clinicians strengthened their expertise through learning on the go. That on-the-job training was far superior to anything their formal educational training could offer. During therapy sessions, it was up to them to identify what worked best for the student through trial and error. The trial-and-error processes necessitated keeping an open mind and exercising flexibility in the plan of care. SLPs achieved best results when building from a solid, simple foundation. Once the student was familiar with the primary functions and results of the symbols and devices, the SLPs could then add on more complex symbols.

Contradictory Data

The majority of SLPs shared that AAC devices have a positive impact on the quality of life for individuals diagnosed with ASD by affording the individual the ability to communicate with others. In general, the views of the SLPs supported the findings of the research, whereby there was no substantial evidence of opposing views or contradictory data. While the primary focus of the research was to determine the influencing factors on the selection of symbols used on AAC devices, one SLP expressed that her main influence was not the symbol selection, but that she had a preference for applying the Language Acquisition through Motor Planning (LAMP) method as a protocol to teach an individual how to use their device. The SLP shared that within the facility, many students learn how to use their device via muscle memory, which is the

foundation of the LAMP method. Through this process, the selection of the symbol is secondary to the placement of the symbol on the device that the individual learns with the repetition of movement. Maya stated that:

> "The symbol doesn't really matter, but how long does it take them to get that motor plan? It's there to there, there to there. But some of them are, like I said, visually oriented and learn best through some of these symbols, regardless of if they have a direct correlation to that concept maybe because some of these are abstract concepts on the device."

> The SLP further stated "the symbol doesn't represent what the concept is, so that makes you think why have that symbol for that concept on the device? And it doesn't really matter. As long as the kid knows. If I go from here to here, I can say this word, and I get this thing. Or I can access this, or I can tell someone this. It makes you think about, do they really need to know the symbol kind of thing?"

Her view reinforces the challenges SLPs face when trying to determine what would be the most appropriate symbol to select, especially when the word does not necessarily have a symbol to represent it (i.e.-the, a, an, etc.).

Summary

An IPA methodology was used to conduct the study, analyze the data, and then used to detail the research findings. Superordinate and subordinate themes were identified

and presented in a narrative form to reflect individual perspectives and commonalities in the overall research. The IPA method was used as the framework for the researcher to determine the factors that influence symbol selection on AAC devices for individuals with ASD. By utilizing the IPA method, the researcher established three superordinate themes: Customizing for Usability and Iconicity, External Influences, and Learning as You Go. The Customizing for Usability and Iconicity superordinate theme highlighted SLP's concern for tailoring devices, language programs and symbols to the individual for ease of use. Some students worked better on motor planning systems while others preferred highly realistic symbols that appealed to their attraction to everyday items like favorite foods.

The second superordinate theme, External Influences, revealed the larger social network in which symbol selection is embedded. Software manufacturers, parents and teachers, insurance funding structures, and even SLP's training background can set the stage for a what kinds of symbols can be selected on particular devices and apps. Finally, the third superordinate theme, Learning as You Go, revealed SLPs indicated that there was no established model they followed to guide them on symbol selection. Rather, they decided on symbols through a "learning on the go" process of trial and error. Together, these superordinate themes demonstrate how the interplay of rigid factors like devices with more malleable factors like individualized customization shape SLP's symbol selection on AAC devices.

Chapter 5

Conclusions, Implications, Recommendations, and Summary

Introduction

This chapter includes the researcher's reflections on the research question using the findings presented in chapter four. In this chapter, the researcher presents the following: interpretation of the themes, evidence-based reflections on the research question, limitations of the study, implications of the findings, and guidelines for practice, and recommendations for future research. The strengths, weaknesses, and limitations of the research are also discussed, and a summary of the research is presented.

Conclusion

The findings presented in chapter four are designed to address the main research question that guided this study. The conclusions to these findings are reflected here in a way that shows the "phenomenological aspect of the lived experience" by SLPs currently working with individuals diagnosed with ASD. According to Smith et al. (2009), the IPA methodology is the appropriate tool to use to accurately capture the lived experience in a meaningful way. For the results to make sense as it relates to the participant's experience, the researcher worked to summarize the views and experiences of the SLPs.

The primary question of the research: What factors are considered by SLPs when selecting icons on AAC devices? The essences of the work done by an SLP occurs during

the initial phase of working with an individual diagnosed with ASD, as they are assessing and analyzing the skills of the individual to determine what will be the most effective method of communication. It is during this time that language is being determined and the foundation of communication for the individuals diagnosed with ASD is being laid to help them develop some level functionality and independence. Oftentimes, the SLP is working with individuals who have an established language system that ranges from gesturing to the use of symbols or a combination of both. SLPs find that the language systems that have been established are often ill-matched or ineffective for the communication process, which leads to the abandonment of the device and the language system.

Issues with the device selection due to funding issues caused families to select languages that are different from what they have been taught during previous lessons, which only further complicated their ability to select useful and meaningful symbols for AAC devices. The lack of training not only on the devices but in ASD also creates a challenge for SLPs who are responsible for setting up communication devices. The specific characteristics of ASD, such as the lack of eye contact and difficulty individuals diagnosed with ASD have with social cues and interactions, requires the SLP to be more thoughtful in their selection, especially knowing that these communication tools will be used long-term (Deloach, 1995; Ganz, Mason, Goodwyn, Boles, Heath, & Davis, 2014; Grynszpan, Martin, & Nadel, 2005; Grynszpan, Martin, Nadel, 2007; Hartley & Allen,

2013; Kunda & Goel, 2011; Pampoulou, 2017; Sampath, Aganwal, & Idurkhya, 2013; Stephensen, 2009; Stoner, 2010).

These findings were acquired by systematically analyzing and deciphering the data collected during the interviews with the participants. The lived experiences of the SLPs selecting symbols for AAC devices were obtained using interpretative phenomenological analysis (IPA). The researcher applied IPA by using the interview process to better understand the SLP's perspective and to witness the manifestation of the phenomenon. The three super-ordinate themes provided answers to the research question with the findings explained as subordinate themes. (see Figure 6).

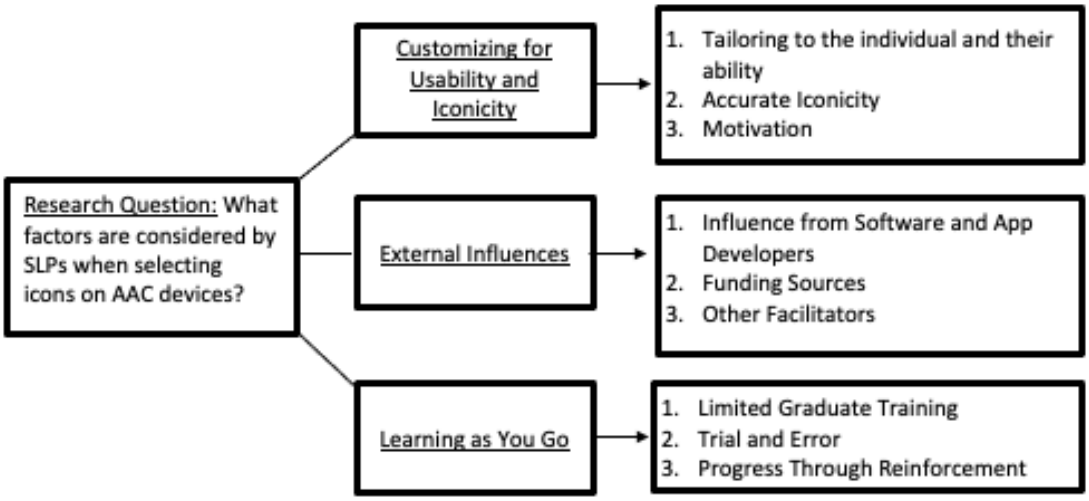

Figure 6. Research question, themes, and findings

For the theme *Customizing for Usability and Iconicity*, the participants shared individuality and student particularity as the primary factors for their selection of icons. According to Pampoulou (2019), individuals diagnosed with ASD show more acceptance of symbols when the object relates more closely to the item desired, which supports the findings of Wobbrock, Gajos, Harada, and Froehlich (2011) who stressed the importance of individualizing for individuals diagnosed with ASD.

There was some discussion with the SLPs on the topic of iconicity and usability of the AAC devices. They shared that this is not something that is widely considered or discussed as they considered what symbols to use on AAC devices. The SLPs talked about tailoring the buttons by changing the background colors, making the symbols bigger or smaller, and using as many realistic pictures as possible. They also briefly spoke about how students are using multiple devices and the need for the symbols to transfer across devices to have their "voice" available in all their environments.

Participants discussed the importance of the individuality and particularity of the student as a key factor into their selection of symbols used on AAC devices. Clark and Williams (2019) shared the process in which individuals diagnosed with ASD have a tendency to show differences in how they process information. The subordinate theme *Tailoring to the Individual and their Ability* provides a detailed description of how SLPs must get to know the student and their families well enough to understand what interest them, what they recognize, and what style of symbol works best to help the individual diagnosed with ASD express their thoughts and ideas. Hartley, Trainer, and Allen (2019)

stated in their research, individuals diagnosed with ASD display varying levels of significant delays in communication, some with severe impairments to their development and expression of language. The analysis of the participant's statements reflected this finding where SLPs shared that the student's ability level impacted their decision making, especially when setting up devices for other aspects of their lives outside of the school setting.

The participant's dedication to ensuring their symbol selection was as close of a representation of the desired object was discussed in the findings of the subordinate theme *Accurate Iconicity*. The SLPs made selecting an accurate symbol a meaningful experience for the individual diagnosed with ASD because they knew it enhanced the usability of the device. It was also noted that the significance of the individual diagnosed with ASD and their understanding of the symbol was also a usability factor (Ivy, Robbins, & Kerr, 2020). The SLPs shared that their students worked better when the symbols resembled the specific real-life object so that it better meets their needs. It was found that SLPs also aim to make holistic decisions in their selection to better accommodate the student.

The subordinate theme *Motivation* stemmed from several SLPs discussing how certain symbols were not as motivating than others. Specifically, the SLPs shared that many students responded more accurately when the symbol looked like things in real-life verses a more generic appearance. The SLPs reported that keeping individuals diagnosed

with ASD motivated to use their AAC device is so important to building their functional skills and has the potential to reduce abandonment of the device (Pampoulou, 2019).

The theme *External Influences* showed that SLPs were often aware of the control they possessed in the selection; however, the influence on symbol selection stemmed from the software and app developers, the device manufacturer representatives who often led their training, the type of funding families received for their devices, and other facilitators who may have more experience or knowledge on the use of these devices. It also contained a wide variety of comments that revealed a complex layer of issues related to the limitations faced by SLPs who utilize AAC devices with individuals diagnosed with ASD. The SLPs explicitly expressed how much of an influence software and app developers and device manufacturer's representatives have on their decisions based on the presentation of information and the materials available Hartley and Allen, 2019).

The two largest producers of AAC devices, Dynavox and PRC, employ speech language pathologists who help design the symbols used on the devices. The participants revealed that there is little room for flexibility in catering the setup of the device with specialized symbols for the user because the SLPs are limited by the manufacturer. This ability was also a hinderance by insurance restrictions that prohibited the users from accessing certain parts of their device for the first year. By not being able to access those components, SLPs were hesitant to change symbols that were established upon the initial implementation.

Another component of the use of these specific devices was the support provided by the manufacturer. Many families remained dedicated to the device manufacturer of choice due to their comfort and ease of use; however, most companies only provide support for five years before terminating a device once they introduce new devices. For SLPs working with families, the changing of devices leads to frustration due to subtle changes that do not match their previous device.

In subordinate theme *Influence from Software and App Developers*, it was discovered after analyzing the data that software and app developers were the greatest source of influence for SLPs. By design, AAC devices are embedded with a proprietary language system that is designed by a team of SLPs who work for that company. These language systems have their own set of symbols and icons, that with proper training by company representatives, can be used effectively by individuals who have challenges with communication. In some cases, companies have even developed motor planning components that work exclusively with their language system to enhance the users experience and usability of the device. The research of DeLoache (1995) addressed how important it is for an individual to understand the symbolic meaning of the symbol by using the direct instruction approach, which reinforced the findings with this research.

Furthermore, subordinate theme *Device Manufacture Representatives and Training* contained many comments by the participants about the high level of support and involvement given by company representatives. These companies spend a great amount of time working with facilities to not only train SLPs on the special features of

the language systems but to also promote their device with the hope that the facility will adapt their device as the primary product. The participants in the study shared how one company offered a great amount of professional development, device support, and frequently visits their facility to the point that it has become the most recommended device of the SLPs and the one that most of them feel more comfortable using. Due to the efforts of this company with the facility to offer high quality support and involvement, many of the participants felt it was a major contributing factor to their symbol selection on AAC devices.

As stated by Pampoulou and Fuller (2020) due to the number of AAC devices available for the use of communication, SLPs are challenged when making decisions about symbols to use with individuals diagnosed with ASD. The participants of the study expressed that they are sometimes overwhelmed by the massive amounts of choice available for representation of words and phrases, making the decision of what to use even more difficult. A great concern of the SLPs was the lack of research done by app developers to ensure that their language systems work for individuals with communication needs. SLPs also stated that many students who used apps successfully on non-AAC devices (i.e.-an iPad or tablet) and showed that they were ready to move to a dedicated AAC device, struggled to transition, so they remained on the app. However, with so many options, finding them most appropriate one was an extremely difficult task.

The emergence of the *Funding Source* theme was interesting and enlightening to hear from the SLPs. The extent of the theme covered not only funding sources but trial

periods and insurance coverage. SLPs expressed how individuals came with various devices that were a reflection of what the funding sources would support. For the SLP, they were limited on what they could do with the device because some were only apps that they may not have had experience with using or did not offer expanded language capabilities. Some had restricted usage due to being only trials, and others were old systems that were no longer supported by their device manufactures. “So depending on their funding sources, it gets complicated. Usually with Medicaid, as long as you have the evidence supporting this trial period that you did with the kid—I can’t remember what the time length is, but you trial a few different devices with the kid. If you saw that they picked up on one over another, and then you think that they would definitely benefit from using that within their educational environment at home, then you go through and go through the process of requesting funding for that device. (Josephine)”

One intriguing factor encountered by SLPs was the Medicaid restriction that limited the usage of some features on the device for the first year of ownership. Users were not able to access the Internet to obtain real-life pictures, forcing the SLP to only select images from the language system of the device, which may or may not meet the need of the individual. The additional roadblock in this is that the individual may not be receptive to changing the symbol once the system opens because they have learned how to communicate with that particular symbol. SLPs must be mindful of the longevity of the language system selected given that many of these individuals will need these devices for a lifetime.

The participants all stated that they wished the process for the selection did not require so many trials of devices and would hope that non-dedicated devices could be a consideration for families that would be covered by insurance or other funding services. Currently iPads and other tablets are not considered dedicated communication devices despite the fact that many of them have apps that are used for communication purposes. For many families, it is a much more affordable option and can have a longer lifespan than the standard five years that is often seen in a dedicated AAC device.

When SLPs are factoring in the types of devices to use with an individual, consideration must also be made for the people who will also use the device with the individual diagnosed with ASD. Beukelman et al. (2005) and Pampoulou and Fuller (2020) speak about subordinate theme *Other Facilitators* who are members of the AAC Technology Team. These members may include family members, general education teachers, caretakers, other SLPs, and other specialist who are also designing pages on the AAC device for the individual with ASD. Having the input of others was a welcomed aspect of the symbol selection for the participants of the study because it gave the SLPs insight on items the individual enjoyed and was motivated by during the communication process. Sampath et al. (2013) found that the involvement of parents and teachers played a significant part in the designing of symbol sets on AAC devices and provided the SLP valuable information to help them better understand the user's needs. The SLPs found that the details provided by other facilitators, parents in particular, helped the SLP

develop a more structured system of symbols on the device that allowed the individual to maximize their usage on the AAC device.

The final theme, *Learning as You Go*, all SLPs supported this finding by sharing that the majority of professions spend a great amount of time completing on the job training through work with other colleagues, trial and error, self-guided professional development, and additional school provided through the device manufacturers and other organizations. The participants expressed that they had limited exposure to AAC devices during their formal training and expressed the need to be flexible and creative during the symbol selection process.

Mendonsa and Tiwari (2018) discussed with SLPs about their training and many of them shared that their lack of training caused them to have various views individuals diagnosed with ASD that impacted how they interacted with them and their devices. Many SLPs expressed that their lack of exposure to not only AAC devices, but also individuals diagnosed with ASD during their college years impacted their decision making of symbol selections. They spent a great amount of time participating in on-the-job training conducted by the manufacturers of the devices or provided by their professional organization. The consensus of the SLPs was that they needed more training in AAC devices where the focus ranges from the different types of devices available to how to appropriately program and implement them for students.

The lack of training on AAC devices was the focus of subordinate theme *Limited Graduate Training*. The participants all agreed that their lack of training greatly impacted

their decision making as it pertains to selection of symbols on AAC devices. As undergraduate students, the participants shared that their exposure to AAC devices is extremely limited if shown at all. Some shared that during their graduate years in college, they may take a course on AAC devices, but the curriculum was very basic and focused on a general population of users, not necessarily on individuals diagnosed with ASD. The same was found to be true for courses with curriculum that focused on individuals with disabilities, that there was no specific focus on autism spectrum disorder.

The greatest exposure to AAC devices came when the SLP completed their internship requirement for licensure. It was during this experience that they conducted sessions on devices with individuals diagnosed with disabilities. As the subordinate theme states, *Trial and Error* through these experiences yielded the greatest amount of learning for the participants. The participants expressed the importance of working with their colleagues for mini professional development sessions and additional training on the devices because they all have different levels of experiences on the language systems.

The final two subordinate themes *Remaining Flexible* and *Progress through Refinement* were stated as important components of the selection process. The participants shared that there were many times when a symbol was selected but it did not provide the intended response. Clarke and Williams (2020) researched the processing of information by individuals diagnosed with ASD and found that the tendency to utilize one modality of input was prevalent over others. For an SLP to fully understand this, they would need to be engaged and in tune with the individual to know how to select

appropriate and useful symbols. Without having this knowledge or background, SLPs encounter additional trials and errors of symbols until the best one was found.

They also shared how important it was to understand the characteristics of the individual diagnosed with ASD because well thought out plans can easily be derailed if the individual is not having a good day, which is something they would have never done in graduate school where they were taught to keep their lesson no matter what may have happened during the lesson. As stated in the subordinate theme *Process through Refinement*, despite the challenges faced by SLPs, skills need be constantly reinforced with the use of the symbols selected to ensure that the individual diagnosed with ASD can develop functional communication skills within a variety of environments and with a variety of communication partners.

Strengths, Weaknesses, and Limitations

The strength of this study is in its novel context to discover the lived experiences of SLPs who work with individuals diagnosed with ASD to help them use AAC devices for the purpose of communication. The researcher discovered the challenges faced by SLPs and learned the significance of their statements about the many variables that impact selection of symbols on AAC devices. Hartley, Trainer, and Allen (2019) reported how individuals diagnosed with ASD display severe impairments in their development of language that creates delays in their communication skills often requiring these individuals to use an AAC device. Given the challenges these individuals face with communication and knowing that these deficiencies tend to appear with receptive and

expressive language, it is imperative that the symbol language developed on the AAC device is selected with deliberate choices that will stand the test of time of that individual's usage of the device for communication purposes (Wainwright, Allen & Cain, 2020).

Though the researcher's connection to the study was a definite strength, it could also be considered partly a weakness, because the researcher has personal experience with AAC devices used with individuals diagnosed with ASD. The researcher's assumptions about symbol selections and SLPs could have easily introduced bias into the study and cause invalid response from the SLPs, including the interpretation and meaning derived from the data. Every attempt was made to ensure that previous assumptions were removed and that the researcher was intent on discovering the participants' experiences with an open mind. The researcher used journaling to help manage ideas, contain bias, and performed a critical review of the literature on the subjects of symbol selections, SLPs, and AAC devices.

The use of a small sample within a specialized school for individuals diagnosed with ASD was not considered a weakness of the study; however, with the use of a phenomenological study, which calls for a sample size of five or more, the sample in this study is deemed acceptable (Creswell et al., 2007). The interview process resulted in data that was deemed reliable and accurate and offered depth of insight into what experiences SLPs face each day.

Implications

Research is limited on the selection of symbols used on AAC devices (Pampoulou & Williams, 2020), especially for individuals diagnosed with ASD. This study has implications for SLPs who conduct research on the selection of symbols and the usability of devices for individuals diagnosed with ASD. Pampoulou and Fuller (2020) stated that future research should focus on comprehending the characteristics of symbols (e.g., design, linguistic and physical attributes) and how the needs and skills of the individuals they support are being met. The research also has implications for families of individuals diagnosed with ASD as they work to learn how to use an AAC device and become fluent in facilitating communication with their child. The use of the phenomenological approach in this study to explore the lived experiences of SLPs to help identify factors that influence symbol selection on AAC devices for individuals diagnosed with ASD provided insight into the challenges and barriers faced by SLPs and provided a deeper understanding of what those factors may be (Deloach, 1995; Pampoulou, 2017). The research supports the need for SLPs to be more mindful of the factors and the impact that they have on influencing their selection of symbols.

The challenge faced by SLPs was that their role as the overseer of the AAC devices; therefore, they are tasked with setting it up and implementing the use of it with the student, but family members and facilitators are not always present to select the symbols, so SLPs must rely on their own experience and expertise. SLPs acknowledged that the majority of the usage time for AAC devices is spent outside of the classroom.

Therefore, it was imperative that the parent or facilitator has input on the symbols selected on the AAC device. Parents shared that they want the symbols to be more reflective of what is representative of their child's daily environment and to be more relevant.

Recommendations for Practice

The study revealed three major areas that the researcher would recommend for SLPs to consider as they work with individuals diagnosed with ASD who utilize AAC devices as a means for communication (see Figure 7). The three superordinate themes uncovered the need to customize for usability and identified iconicity is a crucial component in the initial setup of the AAC device and for the continued use with the individual diagnosed with ASD. To improve the ability of SLPs to focus more on establishing continuity between multiple devices, albeit when a student upgrades to the newest device or there is a change in the device platform or in the SLP, maintaining the language system across the devices could help mitigate frustrations and setbacks in language development. The following recommendations (see Tables 1-4) are intended to help support SLPs in their decision-making process of symbol selection on AAC devices for individuals diagnosed with ASD.

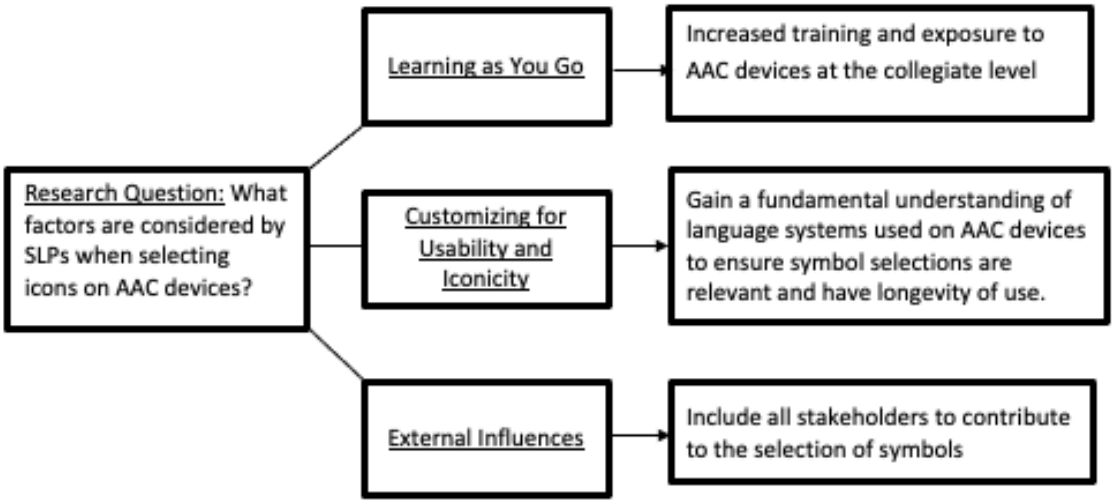

Figure 7. Research questions, themes, and recommendations

Table 1

Research Themes, Recommendations, Specific Details

Theme	Recommendation	Specific Details
Learning as You Go	Increased training and exposure to AAC devices at the collegiate level in training programs for SLPs.	Douglas, West, & Kammes (2020) define SLPs as the practitioners of AAC devices where their role is to be the trainer to staff, operator of the device, and provider of intervention. Therefore, increasing the training and exposure to AAC devices will make their role more effective and targeted in their selection of symbols to align with the needs of the individual.

Customizing for Usability and Iconicity	Gain a fundamental understanding of language systems used on AAC devices to ensure symbol selections are relevant and have longevity of use. The development of training programs for non-bias SLPs and other professions who have no affiliation with manufacturers of AAC device.	Pampoulou (2019) stressed the importance of exploring the significance of iconicity and how it is a key factor in the selection of symbols on AAC devices.
External Influences	Include all stakeholders to contribute to the selection of symbols	Sampath et al. (2013) stated that it is important for parents and teachers to be a part of the design phase on AAC devices and to contribute to the symbol selection as they often serve as the communication partner when the SLP is not present. Including others in this process ensures the individual has success using the device in all environments.

Table 2

Recommendation #1: Increased training and exposure to AAC devices at the collegiate level.

Theme	Recommendation	Specific Details
Learning as You Go	Increased training and exposure to AAC devices at the collegiate level in training programs for SLPs.	Douglas, West, & Kammes (2020) define SLPs as the practitioners of AAC devices where their role is to be the trainer to staff, operator of the device, and provider of intervention. Therefore, increasing the training and exposure to AAC devices will make their role more effective and targeted in their selection of symbols to align with the needs of the individual.

Douglas, West, and Kammes (2020) define SLPs as the practitioners of AAC devices where their role is to be the trainer to staff, operator of the device, and provider of intervention. Therefore, as a matter of priority, SLPs deserve more training at the collegiate level in the area of the AAC devices to better prepare them for their work in the field. The training should entail: 1) exposure to the various forms of AAC devices that includes low and high tech models, 2) discussions about the language systems and the fundamental principle behind how they are developed and implemented, 3) focus individuals diagnosed with disabilities and their characteristics, and 4) extensive practice on designing and structuring symbol systems for usage by individuals who require an AAC device for communication.

Bakar, Raihan, and Zamri (2020) state that SLPs should have mandatory training on individuals diagnosed with ASD based on the unique characteristics of this disability, higher number of children being diagnosed, and the continued misunderstanding of ASD. Bakar et al. stress the importance SLPs spending time with AAC devices, working with families, and collaborating with colleagues so that they are fully equipped to address the needs of these individuals. The need for exposure to AAC devices is a crucial aspect in the training of SLPs since their primary role in schools and other facilities is to conduct communication sessions with individuals who have identified challenges with speech. While not all of these individuals will require the use of an AAC device, the use of

symbols to guide some of their communication needs is a possibility; therefore, having some knowledge of these structured tools is of utmost importance.

Table 3

Recommendation #2: Gain a fundamental understanding of language systems used on AAC devices to ensure symbol selections are relevant and have longevity of use.

Theme	Recommendation	Specific Details
Customizing for Usability and Iconicity	Gain a fundamental understanding of language systems used on AAC devices to ensure symbol selections are relevant and have longevity of use. The development of training programs for non-bias SLPs and other professions who have no affiliation with manufacturers of AAC device.	Pampoulou (2019) stressed the importance of exploring the significance of iconicity and how it is a key factor in the selection of symbols on AAC devices.

Along with knowing these systems, SLPs need to have a fundamental understanding of the structure and principle behind the science of the language systems they may encounter with an individual. Pampoulou (2019) stressed the importance of exploring the significance of iconicity and how it is a key factor in the selection of symbols on AAC devices. The structure of one language system may require the user to incorporate the use of a motor planning program, while another system may utilize a scaffolding method to help build the user's mastery. Through experience and exposure to the various language systems available on AAC devices, SLPs will be better equipped to recommend, design, and implement a functional language program for the individual

diagnosed with ASD that is sustainable for long-term use with multiple users and different environments.

The need for SLPs to gain a better understanding of disabilities and their characteristics will allow them to focus on language systems that are better suited for the individual. Just as a typical child learns their native language, for individuals with disabilities that require the lifetime usage of an AAC device, it is imperative that care and consideration is taken not only by the SLP, but the AAC Technology Team in the selection of the symbols used. Mendonsa and Tiwari (2020) conducted a study on SLPs knowledge and beliefs of Autism and found that many SLPs are providing services to individuals diagnosed with ASD without having accurate knowledge about the characteristics and how they manifest. This can lead to misunderstandings and misconceptions about these individuals as it relates to symbol selections on AAC devices.

Another significant aspect of Mendonsa and Tiwari (2018) study was the impact of the language development setbacks that occur every time individuals change devices or gain a new SLP. These setbacks can be reduced or avoided if the language system is more compatible with the skills of the individual. This study focused on individuals diagnosed with ASD due to some of the unique challenges that are prominent and cause barriers to their ability to communicate. As stated in the DSM-5, one of the significant criteria to be diagnosed with ASD is to display problems with non-verbal and verbal communication. The greatest challenge of autism spectrum disorder is that it manifests so differently in individuals making a specific intervention plan unreasonable since some

individuals may have fully functioning communication skills, while others may be completely non-verbal. In addition, some individuals with ASD are also diagnosed with multiple disabilities that may further complicate the language intervention provided by the SLP. Understanding these nuances will make the work of the SLP more impactful and meaningful throughout the lifespan of the individual.

Aguiar, Galy, Godde, Tremaud, and Tardif (2020) reported how design functions can create multiple challenges for individuals who use AAC devices, such as portability, software issues, low batteries, and configuration of page sets that many SLPs have no experience or expertise in to resolve when they do become an issue. SLPs need time to practice the designing of symbol systems for use on AAC devices to better understand the usability of the design and its ease of use for the individual diagnosed with ASD, as well as how to navigate around these issues that arise.

Since many of these language systems are layered pages that require the user to click through two or three buttons to obtain the desired symbol. For an individual with a lower cognitive level or who has restricted body movement, it may not be conducive for them to shuffle through multiple pages. An SLP who has had the time to learn about structuring AAC devices would be able to design a system for that individual that maximizes their skills without creating a page design that leads to frustration or abandonment of the system. Aguiar et al. (2020) suggest that SLPs put themselves in the place of the user to better understand the experience they may face will when using an AAC device.

Table 4

Recommendation #3: Include all stakeholders to contribute to the selection of symbols.

Theme	Recommendation	Specific Details
External Influences	Include all stakeholders to contribute to the selection of symbols	Sampath et al. (2013) stated that it is important for parents and teachers to be a part of the design phase on AAC devices and to contribute to the symbol selection as they often serve as the communication partner when the SLP is not present. Including others in this process ensures the individual has success using the device in all environments.

The SLP serves as the primary designer of the pages used on an AAC device; however, the sue of the device goes beyond the school environment since it is considered the voice of the individual. Aguiar et al. (2020) strongly recommend that as much as possible, involve the individual diagnosed with ASD and their family in the design process to ensure their needs are being made. This may not always be feasible, but it will lead to higher usage and buy in by the user. Once the individual ages out of the school program, the families will need to know and understand how these systems operate so that the device can be maintained and used. So much time and effort has been put into designing relevant and significant pages with the intention of these devices being lifelong tools, the family voice must be a part of the process. The design process of the language system should be a team approach by all stakeholders involved in helping the individual

diagnosed with ASD learn to communicate more effectively so that they are able to sustain communication skills for long term usability.

Future Research

This study was limited to the experiences of a small number of SLPs who work closely with individuals diagnosed with ASD. Recommendations for future research should further investigate the issues uncovered in this study that focus on factors that influence the selection of symbols used on AAC devices, including exploring the use of symbols across multiple devices used by the individual diagnosed with ASD and the transferability of symbols within the community and other environments. Research with the manufacturers of AAC devices and insurance companies would shed light and understanding of their role in the design, development, and implementation of symbols and the impact it has on SLPs decision making process.

Another area of future research could consist of a deeper study into the specific characteristics of individuals with ASD and how these characteristics impact the processing and retention of information. The use of visual supports is greatly supported for individuals diagnosed with ASD, as it has been shown to help reduce some of the cognitive development issues that persist within ASD, along with communication and social interactions (Hayes et al., 2010; Hartley, Trainer, & Allen, 2019; Wainwright, Allen, & Cain, 2020).

Lastly, gaining a better understanding of iconicity and usability is key to the successful implementation and usage of AAC devices for individuals diagnosed with

ASD. Within the literature review, it was discussed by several researchers how much individuals with ASD rely on the iconic nature of symbols to help them recognize items and retain the information for future usage. The more exposure to items that are representative of the actual item makes the item more relevant and meaningful, which increases the probability that they will be able to communicate their needs and wants to others.

Summary

The study explored the factors that influenced how SLPs selected symbols for use on an AAC device for individuals diagnosed with ASD to answer the research question. First, the main aspect of factors that influence symbol selection was defined throughout the literature review and used to develop the interview questions for the interpretive phenomenological analysis study. The goal of the research was to uncover what factors led to the choices SLPs made in selecting the symbols used on the AAC devices to assist with the communication skills of individuals diagnosed with ASD. The ASD community was the focus of the research based on the uniqueness of one of the primary issues of communication.

The results of the research led to three superordinate themes: Customizing for Usability and Iconicity, External Influences, and Learning as You Go as being the major factors that influence symbol selection making for SLPs. It also led to some implications that included recommendations for future studies. Training is greatly needed for SLPs on the devices that stress the importance of using symbols that are reflective of what is

known and used in the community, as well as support provided to facilitators that help them not only make decisions on symbol selections but also how to create and manage pages to help the user. Iconicity and usability should be a priority to SLPs when selecting symbols for AAC devices used by individuals diagnosed with ASD. The use of IPA in future studies would help researchers identify additional factors that would be useful to SLPs as they continue to improve their services with ASD.

As a result of the research findings, SLPs can utilize the recommendations presented to better understand the factors that influence symbol selection on AAC devices for an individual diagnosed with ASD and aim to be more targeted on their selections and more aware of the longitudinal usage of these symbols across multiple devices during the lifespan of the individual. Utilizing the findings of the research, individuals diagnosed with ASD will have the ability to communicate beyond their school years knowing that the language system and symbols selected have been carefully designed to meet their needs. All individuals deserve a sustainable quality of life and the foundation of having the ability to communicate. When SLPs are trained and can hone their skills, their ability to increase the ease of use and functionality of AAC devices grows and the individual diagnosed with ASD benefits for the rest of their lives.

Appendix A

IRB Approval Letter- Nova Southeastern University

NOVA SOUTHEASTERN UNIVERSITY
Institutional Review Board

MEMORANDUM

To: **William T Dauterman**

From: **Ling Wang, Ph.D.,**
Center Representative, Institutional Review Board

Date: **March 29, 2019**

Re: **IRB #: 2019-205; Title, "A Study of Factors that Influence Symbol Selection on Augmentative and Alternative Communication Devices for Individuals with Autism Spectrum Disorder"**

I have reviewed the above-referenced research protocol at the center level. Based on the information provided, I have determined that this study is exempt from further IRB review under **45 CFR 46.101(b) (Exempt 2: Interviews, surveys, focus groups, observations of public behavior, and other similar methodologies)**. You may proceed with your study as described to the IRB. As principal investigator, you must adhere to the following requirements:

1) CONSENT: If recruitment procedures include consent forms, they must be obtained in such a manner that they are clearly understood by the subjects and the process affords subjects the opportunity to ask questions, obtain detailed answers from those directly involved in the research, and have sufficient time to consider their participation after they have been provided this information. The subjects must be given a copy of the signed consent document, and a copy must be placed in a secure file separate from de-identified participant information. Record of informed consent must be retained for a minimum of three years from the conclusion of the study.

2) ADVERSE EVENTS/UNANTICIPATED PROBLEMS: The principal investigator is required to notify the IRB chair and me (954-262-5369 and Ling Wang, Ph.D., respectively) of any adverse reactions or unanticipated events that may develop as a result of this study. Reactions or events may include, but are not limited to, injury, depression as a result of participation in the study, life-threatening situation, death, or loss of confidentiality/anonymity of subject. Approval may be withdrawn if the problem is serious.

3) AMENDMENTS: Any changes in the study (e.g., procedures, number or types of subjects, consent forms, investigators, etc.) must be approved by the IRB prior to implementation. Please be advised that changes in a study may require further review depending on the nature of the change. Please contact me with any questions regarding amendments or changes to your study.

The NSU IRB is in compliance with the requirements for the protection of human subjects prescribed in Part 46 of Title 45 of the Code of Federal Regulations (45 CFR 46) revised June 18, 1991.

Cc: Laurie Dringus, Ph.D.
Ling Wang, Ph.D.

Appendix B

Informed Consent Form

Consent Form – Nova Southeastern University

NOVA SOUTHEASTERN UNIVERSITY
College of Engineering and Computing

General Informed Consent Form

A Study of Factors that Influence Symbol Selection on Augmentative and Alternative Communication Devices for Individuals with Autism Spectrum Disorder

Who is doing this research study?

College: College of Engineering and Computing
Principal Investigator: William T. Dauterman, BS, MS
Faculty Advisor/Dissertation Chair: Dr. Laura Dringus, BS, PhD
Site Information: Haugland Learning Center, 7690 New Market Center Way, Columbus OH 43235, Lynn Dudek, 614-602-6473
Funding: Unfunded

What is this study about?

Hartley and Allen (2014) stated that there are no standard guidelines for the selection of icons and symbols on AAC devices for individuals with ASD. Pampoulou (2017) stated that the lack of standard guidelines makes it challenging for SLPs to choose symbols for use on AAC devices, and SLPs often rely on their own knowledge and experience instead of using evidence-based best practices. The addressable problem of this study is to continue the work of Hartley and Allen to examine how SLPs choose the symbols and pictures displayed on AAC devices for users and to research further the factors that influence the selection of symbols by SLPs. The goal of the research is to identify the factors that influence symbol selection so that guidelines can be developed and recommended to SLPs when implementing an AAC device for individuals with ASD.

Why are you asking me to be in this research study?

You are being asked to be in this research study because of your background as a speech language pathologist who works with individuals diagnosed with autism spectrum disorder that also use an augmentative and alternative communication device. This study will include about 5-8 people.

What will I be doing if I agree to be in this research study?

While you are taking part in this research study, you will be interviewed on-site for up to 1 hour one time only.

Research Study Procedures - as a participant, this is what you will be doing:

Your participation in this research will begin by answering a series of questions that serve as a screener. The answer to these questions will determine if you meet the qualifications to participate in the research. Once it has been determined that you qualify, a 1-hour interview will be conducted with the use of an interview protocol to help guide the research. Upon completion of the interview, you will have the opportunity to ask any follow up questions. For your time, a gift card will be given upon completion.

Could I be removed from the study early by the research team?

There are several reasons why the researchers may need to remove you from the study early. Some reasons are: you do not meet the qualifications needed for the study, your experience with individuals diagnosed with ASD is limited, or you do not have enough background in AAC devices.

Are there possible risks and discomforts to me?

This research study involves minimal risk to you. To the best of our knowledge, the things you will be doing have no more risk of harm than you would have in everyday life.

What happens if I do not want to be in this research study?

You have the right to leave this research study at any time, or not be in it. If you do decide to leave or you decide not to be in the study anymore, you will not get any penalty or lose any services you have a right to get. If you choose to stop being in the study, any information collected about you **before** the date you leave the study will be kept in the research records for 36 months from the end of the study but you may request that it not be used.

What if there is new information learned during the study that may affect my decision to remain in the study?

If significant new information relating to the study becomes available, which may relate to whether you want to remain in this study, this information will be given to you by the investigators. You may be asked to sign a new Informed Consent Form, if the information is given to you after you have joined the study.

Are there any benefits for taking part in this research study?

There are no direct benefits from being in this research study. We hope the information learned from this study will contribute to the field of AAC research and help SLPs gain a better understanding about the factors that influence the selection of icons on devices.

Will I be paid or be given compensation for being in the study?
You will be given a $25 Amazon gift card as compensation for being in this research study upon completion of the interview.
Will it cost me anything?
There are no cost to you for being in this research study.
How will you keep my information private?
Information we learn about you in this research study will be handled in a confidential manner, within the limits of the law and will be limited to people who have a need to review this information. All information will be stored on an encrypted hard drive only accessible by the researcher. This data will be available to the researcher, the Institutional Review Board and other representatives of this institution, and any regulatory and granting agencies (if applicable). If we publish the results of the study in a scientific journal or book, we will not identify you. All confidential data will be kept securely, and data will be kept for 36 months from the end of the study and destroyed after that time by erasing the hard drive of the computer.

Will there be any Audio or Video Recording?
This research study involves audio and/or video recording. This recording will be available to the researcher, the Institutional Review Board and other representatives of this institution, and any of the people who gave the researcher money to do the study (if applicable). The recording will be kept, stored, and destroyed as stated in the section above. Because what is in the recording could be used to find out that it is you, it is not possible to be sure that the recording will always be kept confidential. The researcher will try to keep anyone not working on the research from listening to or viewing the recording.
Whom can I contact if I have questions, concerns, comments, or complaints?

If you have questions now, feel free to ask us. If you have more questions about the research, your research rights, or have a research-related injury, please contact:
Primary contact:
William T. Dauterman, BS, MS can be reached at 614-266-3510 during and after normal work hours.
Research Participants Rights
For questions/concerns regarding your research rights, please contact:
Institutional Review Board
Nova Southeastern University
(954) 262-5369 / Toll Free: 1-866-499-0790
IRB@nova.edu

You may also visit the NSU IRB website at www.nova.edu/irb/information-for-research-participants for further information regarding your rights as a research participant.

Research Consent & Authorization Signature Section

Voluntary Participation - You are not required to participate in this study. In the event you do participate, you may leave this research study at any time. If you leave this research study before it is completed, there will be no penalty to you, and you will not lose any benefits to which you are entitled.

If you agree to participate in this research study, sign this section. You will be given a signed copy of this form to keep. You do not waive any of your legal rights by signing this form.

SIGN THIS FORM ONLY IF THE STATEMENTS LISTED BELOW ARE TRUE:

- You have read the above information.
- Your questions have been answered to your satisfaction about the research.

Adult Signature Section

I have voluntarily decided to take part in this research study.

Printed Name of Participant	Signature of Participant	Date
Printed Name of Person Obtaining Consent and Authorization	Signature of Person Obtaining Consent & Authorization	Date

Appendix C

Site Approval Letter

Site Approval Letter

SITE APPROVAL LETTER

Haugland Learning Center
2540 Billingsley Road
Columbus, Ohio 43235
614-470-2018

Subject: Site Approval Letter

Mr. William T. Dauterman:
This letter acknowledges that I have received and reviewed a request by William T. Dauterman to conduct a research project entitled "A Study of Factors that Influence Symbol Selection on Augmentative and Alternative Communication Devices for Individuals with Autism Spectrum Disorder" at Haugland Therapy Services and I approve of this research to be conducted at our facility.
When the researcher receives approval for his/her research project from the Nova Southeastern University's Institutional Review Board/NSU IRB, I agree to provide access for the approved research project. If we have any concerns or need additional information, we will contact the Nova Southeastern University's IRB at (954) 262-5369 or irb@nova.edu.

Sincerely,

Lynn Mdudek MS CCC-SLP, MBA, BCBA

Ms. Lynn Dudek, MS, CCC-SLP, MBA, BCBA
Director of Clinical Therapies
614-580-4906
lynn.dudek@hauglandlearningcenter.com

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