The Effects of a Picture Exchange Communication System (PECS) on the Communication of an individual with Autism Spectrum Disorder (ASD)

Thesis

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Abstract

Autism Spectrum Disorder (ASD) is a neurodevelopmental disability characterized in part by deficits in social communication. When communication is hindered, the ability to request one's wants, needs, and desires, the ability to form relationships, share interests becomes greatly limited (Stoner et. al., 2006). The Picture Exchange Communication System (PECS) was developed for individuals with limited verbal and functional communication skills. The study's purpose was to evaluate the effectiveness of teaching PECS to an individual with ASD. A multiple-baseline across behaviors design was used to examine the effects of PECS training on independent requests made by one 5-year-old child with ASD and limited communication skills. Results indicated that the participant acquired PECS skills for requesting independently across three preferred items and activities. This study replicates previous findings that PECS training can be an effective way to teach children with ASD and limited communication skills. The study also extends research by demonstrating the effectiveness of PECS compared to the absence of intervention and for a child with no previous exposure to communication interventions and limited interests.

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Fields of Study

Major Field: Educational Studies

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CHAPTER 1

INTRODUCTION

About 1 in 44 children have been identified with ASD according to estimates from CDC's Autism and Developmental Disabilities Monitoring (ADDM) Network (Center for Disease Control and Prevention [CDC], 2018). Autism Spectrum Disorder (ASD) is a neurodevelopmental disability that is characterized by social and communication deficits and the presence of restricted interests and repetitive behaviors (5th ed.; DSM–5; American Psychiatric Association, 2013). Given that it is one of the defining features of autism, social-communication deficits are a critical area for intervention for this population. Communication is a vital social phenomenon and is crucial for a better social life and ability to express one's wants, needs, and desires. Children with autism seem to exhibit great variation in their communication skills.

Children who do not have a functional means of communication face many significant obstacles in their daily lives. When an individual can communicate effectively and functionally, they are able to begin making choices and gain independence (American Speech-Language-Hearing Association [ASHA], n.d.). Children with communication deficits face issues with getting their basic needs and wants met regularly. When an individual does not have the proper means to functionally communicate their wants and needs it can also cause other obstacles to arise such as challenging behaviors. Deficits in communication skills are closely related to the occurrences of challenging behaviors because it is believed that it serves as a form of communication. When a child with ASD is not able to express their wants, needs, and desires in an appropriate manner it can cause challenging behaviors that also create substantial obstacles for not only the individual but for others around them as well (Mancil & Boman, 2010). Children with ASD have significant deficits that affect communication skills and social interaction. When

functional communication is hindered, the ability to form relationships with others, share interests and values, and their ability to interact with others becomes limited (Stoner et al., 2006).

Fortunately, augmentative and alternative communication (AAC) can give children who have limited speech the opportunity to communicate effectively. Augmentative and alternative communication is an evidenced-based practice defined as interventions that use and/or teaching the use of a system of communication that is not verbal/vocal which includes aided and unaided communication systems. Aided communication systems include low tech systems, exchanging objects/pictures, and high-tech systems like speech generating devices (SGDs). Unaided communication systems include the use of sign language and gestures to communicate. Augmentative and alternative communication systems have helped teach functional communication skills to individuals who have limited speech or find verbal communication challenging. Lal (2010) investigated the effects of alternative and augmentative communication on language and social behavior of children with autism. Participants included 8 children with an ASD diagnosis whose ages ranged from 9 to 12 years old. The study aimed to determine the effectiveness of Makaton Vocabulary Language Program, an alternative and augmentative communication (AAC), on the development of language and social behavior in children with ASD. The results shown with these tools showed that AAC training and usage were effective in enhancing language and communication and social behaviors in children with ASD.

One particular form of AAC, Picture Exchange Communication System (PECS), has a strong evidence base for teaching beginning communication. The Picture Communication System was developed by Bondy and Frost (1994) for young children with ASD and is an example of a low-tech communication system. According to Bondy and Frost, unlike other AAC systems or traditional approaches to speech training, PECS does not emphasize prerequisite

skills, including vocal/fine motor imitation and attending skills. PECS utilizes picture icons, a communication binder, and six distinct phases, only phase 1 was implemented in the current study. In Phase 1, the child is taught to pick up a single picture icon, reach toward a communication partner, and release it in their hand. Phase 1 is taught using two interventionists, a communication partner, and a physical prompter. The communication partner is positioned in front of the child and the physical prompter is positioned behind or next to the child to provide prompts throughout training sessions. A trial begins when a child approaches or shows interest in a preferred item that is placed in view, one interventionist physically guides the child to pick up the picture of the preferred item and hand it to the other interventionist, the communication partner. Immediately after delivering the picture, the child can access the preferred item. The environment is arranged to provide the child with opportunities to request and physical prompts are gradually faded as training proceeds.

PECS consists of 6 phases, each with different emphasis on skills to teach to learners. Phase 1 is when a learner is taught to pick up, reach, and release a picture icon to request preferred items or activities. Phase 2 is the distance and persistence phase which consists of teaching the learner to request preferred items by exchanging the picture icon even when the communication partner or the PECS communication book is not directly in front of them. In this phase the distance between the learner and the communication book or the communication partner increases gradually. Phase 3 is the picture discrimination phase with a goal of teaching the learner to discriminate a specific picture icon from others. Two picture icons are presented during this phase, a preferred item, and a non-preferred item. The learner will receive the item corresponding to the selected picture icon. Phase 4 aims to increase the complexity of communicative exchanges by teaching the learner to request items using a sentence strip. The

learner is taught to place picture icons on a sentence strip that reads “I want,” detach the sentence strip, and then hand the strip to the communication partner. Phase 5 teaches the learner to respond to questions such as, “What do you want?” and the learner uses their sentence strip to respond. Phase 6 aims to teach learners to label items in response to a different question such as, “What do you see?” The learner is taught to use another sentence starter that reads “I see,” place the appropriate picture icon on the new sentence strip, and hand it to the communication partner in response to a question (Bond & Frost, 2002)

There are studies that show PECS to be a viable intervention to increase communication skills in children with ASD. Agius and Vance (2015) compare the efficacy of the Picture Exchange Communication System (PECS) and iPads used as speech generating devices (SGDs) in preschool children with ASD. Results of this study show that both PECS and SGDs are appropriate in teaching requesting skills to individuals with ASD in early intervention. In another study, Ganz et al. (2012) conducted a single case study to discuss the use of the Picture Exchange Communication System (PECS) for children who lack functional communication skills. The study was done with a 5-year-old girl with ASD who had complex communication needs and did not speak. All six phases were taught to the child and researchers concluded that the implementation of PECS was beneficial in increasing the child’s communication skills. Results show that she mastered all six phases of PECS, generalized the skills across multiple settings, and PECS facilitated an increase in requesting. Dogoe, Banda, and Lock (2010) also examined the effects of PECS by using a single-subject multiple baseline across participant's design. Three preschoolers participated in the study; ages ranged from 3 to 5 years old. Participants had an ASD diagnosis and little to no functional communication skills. Two behaviors were examined during this study, requesting and generalization, and three phases of

PECS were implemented. The study's results showed that all participants gained the necessary skills for requesting and generalized them across settings.

Although there are many published research studies on PECS a majority of the single-subject design studies aimed to compare PECS with another training program or AAC device, some participants were exposed to some sort of communication mode in the past, and other studies included multiple participants who have clear reinforcers and preferred items to use during PECS intervention. For instance, Aguis and Vance (2015) reported results for PECS and an iPad program in order to compare their effects. In another study by Ganz et. Al (2012), the participant was exposed to sign language in the past before implementing PECS training. In the current study I aim to contribute to existing literature by examining the effects of PECS training sessions alone, while working with one 5-year-old boy with ASD who had no previous experience with AAC devices, no functional communication, had no clear motivators or preferred items. In this replication study, I aim to contribute to the evidence base for PECS by replicating its effect while working with a child with autism with limited speech. Specifically, I address the following research questions:

1. What are the effects of implementing Phase 1 of PECS on the number of appropriate requests communicated by a child with ASD?
2. What are the perceptions of the child's mother and behavior technician about the impact and value of the intervention?

CHAPTER 2

METHOD

Participant

One child with autism participated in this study in his home. John a 5-year-old Chinese American male with a diagnosis of ASD had no functional communication skills and did not have an existing AAC system in place to meet his communication needs. John's speech language development was assessed in November 2021 by a Speech Language Pathologist. He was identified as having receptive, expressive, and pragmatic language delays. John would on occasion, usually only when highly motivated, use gestures to request wants, needs, desires. He would reach for, guide a person toward, and gesture toward the preferred item, activity, or foods he wants. John had been observed to request for his iPad using one sound (i.e., /ī/). John did not have a means of communicating with others at the start of the study, both verbally or with the use of an Augmentative and Alternative Communication (AAC) System.

Setting and Materials

John received in-home Applied Behavior Analysis (ABA) therapy from a community provider. John received in-home therapy 4 days a week for 4 hours a day. Therapy was provided in the participant's living room with a gate blocking access to the rest of the house. The living room consisted of a sofa, a chair, a small table for John at, and a bin with toys.

Intervention materials included a PECS communication book, a three-ring binder, included laminated sheets inside to be used to organize picture icons. The PECS book included Velcro on the cover and on the sheets inside the book. In addition, picture icons of preferred items, activities, and foods. The picture icons were made using real photographs of each behavior used for the study (i.e., stretchy toy worm, Peppa Pig music, and cheddar rice cakes). These picture icons had Velcro on the back of each one to place them inside the book and on the cover. This

also allowed the target participant to easily remove the picture icons from the communication book.

Dependent Variable

The dependent variable measured in this study was the number of independent requests using the Picture Exchange Communication System (PECS). Independent requests were defined as picking up a picture icon, reaching toward the communication partner, and releasing the PECS icon into her outstretched hand with no prompting. Pick up the icon was defined as the participant picking up and removing the PECS icon off a PECS book. Reach was defined as the participant bringing the PECS icon toward the communication partner. Release was defined as the participant letting go of the PECS icon into the communication partner's hand. Independent requests were measured by the percentage of independent picture exchanges per session, with 10 trials per PECS session. The participant received a (+) or (-) for each step in Phase 1. Independent requests were recorded if the target participant was able to pick up, reach and release the picture icon with zero prompts for each step in Phase 1 (i.e., received a (+) for all three steps).

Data were collected using a frequency count for all three behaviors throughout the study. Baseline and intervention session data were all recorded in person using paper data sheets. Each step of an independent request was marked with a (+) or (-) on the PECS data sheet. Each behavior (Stretchy toy, music, and rice cakes) was recorded on their own data sheet with the date, day of baseline or intervention in the notes section of the sheet, and appropriate behavior in the picture icon column. The percentage of independent PECS requests were calculated by dividing the number of trials in which the participant independently completed all steps of the picture exchange to the total number of trials. The number was then multiplied by 100 to get the percentage of independent requests.

Interventionists

Two interventionists implemented the PECS intervention. This included the study's author, a graduate student at The Ohio State University. The author was a 26-year-old Hispanic woman with 4 years of experience in Applied Behavior Analysis and an undergraduate degree in Speech Language Pathology. In addition, a Registered Behavior Technician (RBT), Taylor, who worked for the same company and already had a relationship with John and his family assisted with implementation. This RBT was a 24-year-old White woman with one year of experience. Both the author and the RBT worked for a company that provides in-home ABA services to children with autism.

Interobserver Agreement

Reliability was measured with an interobserver agreement (IOA) conducted by one independent trained observer. Brooke Lipnos was a graduate student who was pursuing a master's degree in special education with an emphasis in Applied Behavioral Analysis and Visual Impairments. Observations were conducted weekly and in an average of 20% of all training sessions in baseline and intervention. Agreement was defined as both the observer and experimenter scoring all behaviors in each trial the same. IOA was calculated by calculating the frequency of exact agreement of the behaviors. The total number of times the trained observer agreed with the first was divided by the total number of behaviors that the first recorded. Overall interobserver agreement was 100% across all variables and sessions.

Experimental Design and Procedures

The interventionist implemented a multiple-baseline across behaviors design, a single-case design in which three behaviors will be assessed and the intervention will be introduced in a staggered fashion (Cooper, Heron & Heward, 2020). The multiple baselines across behaviors design were used to evaluate the effectiveness of a Picture Exchange Communication System

(PECS) on the communication of an individual with Autism Spectrum Disorder (ASD). One participant will be used for this study and each behavior will begin in the baseline condition to determine their initial, stable expression and then the intervention will be applied to one of the items or activities while the others are unaffected.

Pre-baseline Procedures

Prior to data collection, observations, an informal preference assessment, and interviews were conducted to gain information about the participant to select the objects requested using PECS. Informal interviews were conducted with the participants' Board-Certified Behavior Analyst (BCBA), RBT, and parents. During these interviews they were asked about the participant's preferred activities, tangibles, and food or drinks. The results of the interviews suggested that John enjoyed social/physical play and cheddar rice cake snacks; and that he did not engage or functionally play with toys he has at home. During observations I brought a few novel items to conduct a preference assessment. Novel items included new snacks, activities, and sensory toys. Snacks included Cheetos, Cheez It Snaps, Doritos, and gummy worms. Sensory toys/new activities included, a stretchy sensory worm, a light up bouncy ball, slinky, Peppa pig music, a bubble machine, and a blanket that was used to pull John from one end of the living room to the other. I took notes on items or activities in which John showed interest or engagement. After conducting all the interviews, observations, and preference assessment, three behaviors were selected: music, cheddar rice cakes, and the stretchy sensory worm.

Baseline

After selecting the three behaviors the target participant would be working on for the study, the baseline condition began. During the baseline condition, the target participant was positioned in front of the communication partner. The communication partner showed the participant that a preferred item, food, or activity is available and placed the corresponding

picture on the PECS communication book in front of the student. For activities, the participant was provided with a few seconds of the activity to show availability. During this time, If the target student showed interest in the item or activity, the communication partner held onto the item or waited for an average of 30 seconds to allow for the student to request using the PECS. After the 30 seconds elapsed the participant was given a brief moment with the item or activity. No prompting or support was given to John during this time.

Intervention: Picture Exchange Communication System Phase 1

PECS training sessions followed the protocols described by Frost and Bondy (2002) in the *Picture Exchange Communication System Training Manual* (2nd ed.). PECS teaches consists of 6 phases, with each phase having a different emphasis and building on the previous phase. In this study only the first phase of PECS was implemented. PECS training sessions occurred Monday, Tuesday, Wednesday, and Friday with two to three sessions each day. The number of sessions depended on attendance and availability of the RBT during the week.

Phase 1 PECS implementation focused on teaching the participant to physically exchange a picture icon for a preferred item or activity. The target participant was trained with systematic fading of physical prompts to exchange PECS icons for three behaviors (music, rice cakes, and stretchy toy). During this phase, training sessions were conducted by two interventionists. The first acted as the communication partner and the second, RBT, acted as the physical prompter for the study. Similar to baseline, the target participant was positioned in front of the communication partner and was shown that the preferred item or activity was available (stretchy toy, music, rice cakes). The PECS communication book was positioned in front of the participant during this time. When the participant reached for or showed interest in the item, the physical prompter interrupted and physically guided the client through the next steps. The RBT prompted the participant to pick up the corresponding picture icon, reach over to the communication partner,

and release it into the communication partner's hand. After this exchange occurred the participant was given access to the preferred food, or activity and the communication partner verbally praised the student using specific language (i.e., "Music, you asked for music."). The picture icon was placed back on the PECS book for the next trial. This was repeated until the target participant reached mastery. Mastery was set to 80% of exchanges performed independently for three consecutive 10 trial sessions.

Social Validity

Following the study's conclusion, a survey was given to the RBT and the participant's caregiver to determine their perceptions of the intervention's impact and value. The survey used a scale that assessed how much they agreed or disagreed with a statement (i.e., strongly agree/disagree, agree/disagree, and slightly agree/disagree). All 10 survey items are reported in Figure 1.

Figure 1. Social Validity Survey for John's Mother and Taylor, John's Registered Behavior Technician.

Caregiver Survey

Directions: Rate the degree to which you agree with the statements below

	Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
I think its important for my child to develop communication skills	◯	◯	◯	◯	◯	◯
PECS is a good way to address the needs of my child with Autism	◯	◯	◯	◯	◯	◯
I think my child enjoys using PECS	◯	◯	◯	◯	◯	◯
As a result of PECS training, my child's ability to request for wants, needs, and desires increased	◯	◯	◯	◯	◯	◯
I would recommend the use of this intervention to a someone who has a child with ASD	◯	◯	◯	◯	◯	◯

Behavior Technician Survey

Directions: Rate the degree to which you agree with the statements below

	Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
As a result of PECS training, the student with autism engaged in more requesting throughout sessions	◯	◯	◯	◯	◯	◯
I am motivated to continue using this strategy	◯	◯	◯	◯	◯	◯
I feel I was effective in my role as a physical prompter	◯	◯	◯	◯	◯	◯
I would recommend the use of this intervention with other students	◯	◯	◯	◯	◯	◯
Overall, I enjoyed participating in this study	◯	◯	◯	◯	◯	◯

CHAPTER 3

RESULTS

The introduction of PECS training sessions coincided with clear and substantial changes in John's independent requests across three behaviors (stretchy toy, music, and rice cakes). To analyze data, we used visual analysis, the most widely used and well-established method for analyzing single-case designs studies. Specifically, we used the methods described in Gast and Ledford (2014). Visual analysis involves examining graphed data within and across experimental phases, and it is concluded that basic effect has occurred when there is a change in the dependent variable when the independent variable is actively manipulated. When three or more basic effects are detected through visual analysis, it can be concluded that there is a functional relation between the independent and dependent variables (Cooper, Heron, & Heward, 2017). Based on my visual analysis, I detected 3 basic effects, and therefore concluded that there is a functional relation between Phase 1 of PECS and independent requests by a child with ASD. All data are graphed in Figure 2. Visual analysis of each basic effect is detailed below.

Stretchy Toy

During the baseline condition, data were at a near-zero level with low variability. John only independently requested a stretchy toy one time in one session and zero times in all other sessions. According to the baseline data sheets, John showed he was able to pick up the picture icon but was not able to reach toward or release the icon into the communication partner's hand. Immediately after the introduction of Phase 1 of PECS, the level of the data increased to 10% and trended to 50% and remained at 100% for the remainder of the study.

Music

During the baseline condition, data were at a near-zero level with low variability. Across the 10 sessions of baseline, John independently requested one time in one session, two times in

another session, and zero times in all other sessions. According to the baseline data sheets, John showed he was able to pick up the picture icon but was not able to reach toward or release the icon into the communication partner's hand. Immediately after the introduction of Phase 1 of PECS, the level of the data increased to 60% and trended to 70% and remained at 100% for the remainder of the study.

Rice Cakes

Across the 16 sessions of baseline, data were at a near-zero level with low variability. John received a 10%, 20%, and 30% for independently requesting using PECS across 16 sessions. John received a 10% during session 3, 10, 12, 14 and received a 20% during sessions 9 and 13. 30% can be seen on session 11 of baseline. With the introduction of the intervention, the data path began to show an upward trend and John showed high levels of independent requests. Immediately after the introduction of Phase 1 of PECS, the level of the data increased to 90% and remained at 100% for the remainder of the study.

Social Validity

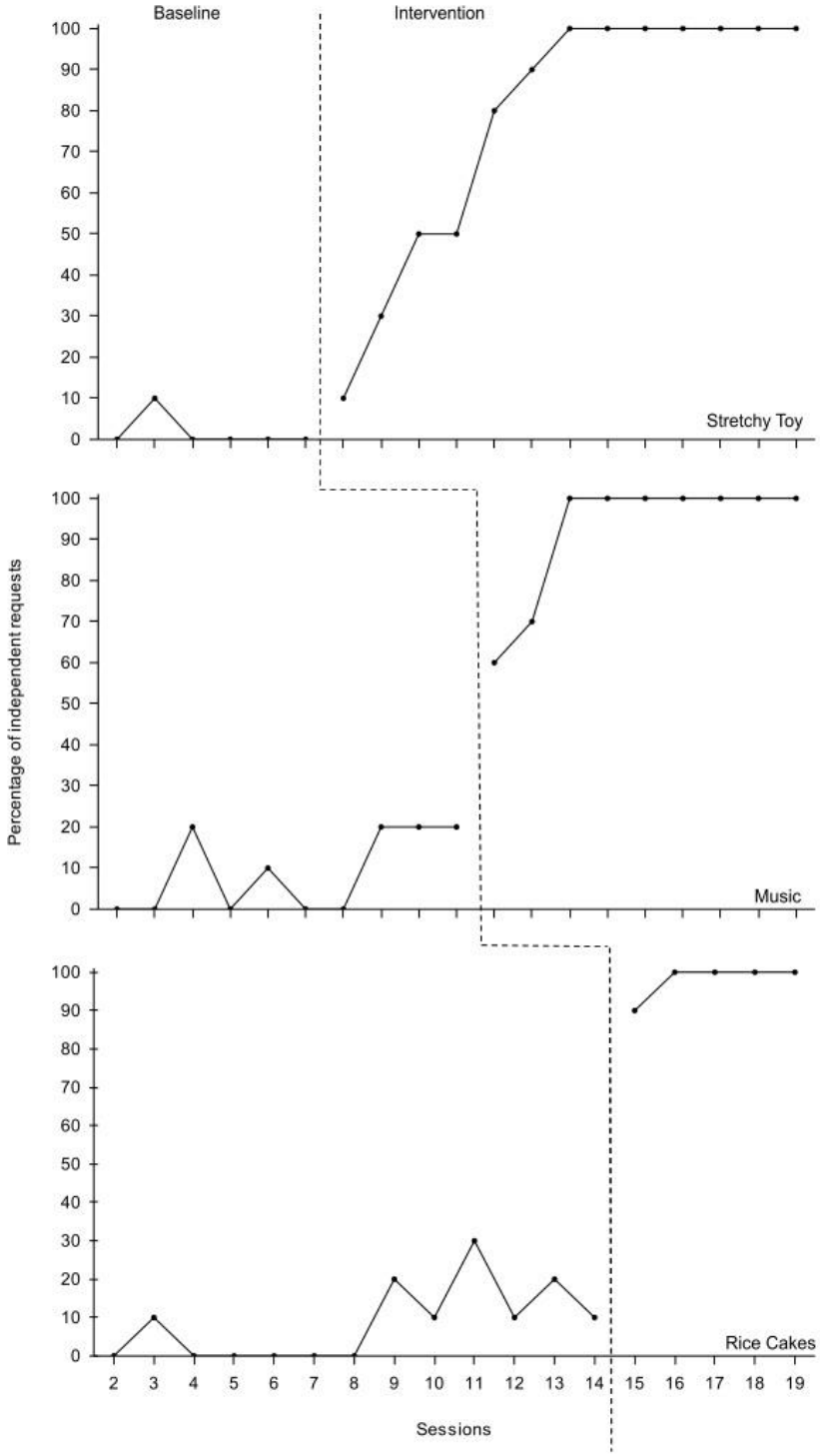
Taylor

The survey provided to Taylor after the study instructed her to rate how much she agreed with the statements provided to her. Taylor strongly agreed with the statement, “As a result of PECS training, the student with autism engaged in more requesting throughout sessions.” Taylor strongly agreed with the statement, “I am motivated to continue using this strategy.” Taylor strongly agreed with the statement, “I feel I was effective in my role as a physical prompter.” Taylor strongly agreed with the statement, “I would recommend the use of this intervention with other students.” Taylor also strongly agreed with the statement, “Overall, I enjoyed participating in this study.” Taylor also expressed that she believed the intervention was effective, easy to use and learn as a prompter, and beneficial to her client.

Mother

The survey provided to the participant's mother following the study instructed her to rate the degree to which she agreed with the statements provided. John's mom strongly agreed with the statement, "I think it's important for my child to develop communication skills." John's mom strongly agreed with the statement, "PECS is a good way to address the needs of my child with Autism Spectrum Disorder." She strongly agreed with the statement, "I think my child enjoys using PECS." John's mom also strongly agreed with the statements, "As a result of PECS training, my child's ability to request for wants, needs, and desires increased" and "I would recommend the use of this intervention to someone who has a child with Autism." At the end of the study John's mom expressed she was excited to continue its use in the home/community, she and her family have benefited from the use of PECS, and she also seen a decrease in his behaviors since introducing PECS.

Figure 2. Percentage of correct independent requests per session. Data was collected for every session and every behavior (i.e., Stretchy toy, Music, Rice cakes) for baseline and intervention phases



CHAPTER 4

DISCUSSION

Communication is a vital part of our world. It allows individuals the ability to request their wants and needs, make choices, and build relationships with others. While there is initial evidence supporting the effectiveness of PECS for improving functional communication skills of young children with ASD, there is a need to replicate those findings in new situations and settings. The purpose of this replication study was to contribute to the evidence base for the effectiveness of PECS training on the communication skills of one individual with a diagnosis of ASD and limited speech by doing so with an individual with no prior exposure to communication interventions and by looking at the effects of the Picture Exchange Communication system alone. Results showed that PECS Phase 1 was an effective means to increase independent requests for a young child with ASD. These findings extend the literature regarding PECS and early communication for young children with ASD in a number of ways.

First, this study replicated previous findings that Phase 1 of PECS can enable young children with ASD to independently request preferred items through picture exchange. Furthermore, the participant was taught to use this skill across three different items or activities. The findings replicated those obtained from previous research on PECS that report that children with ASD were able to master all six phases of PECS, were able to generalize skills across multiple people and settings and showed an increase in requesting skills (Aguis & Vance, 2015; Ganz et al., 2012; Dogoe, Banda, & Lock, 2010). The current study showed the effectiveness of PECS training sessions alone while working with one 5-year-old child with ASD who had limited communication, no experience with any AAC devices, and limited interests which could make it hard to find preferred items and activities. The differences presented in the current study are important in showing that a child with limited interests and no previous exposure to AAC

devices or interventions can benefit from PECS training. The current study shows that both formal and informal preference assessments can aid in finding preferred items for PECS training and that an individual can master its use with no previous exposure to similar interventions. It is also important to note that the current study examines the effectiveness of PECS and PECS alone on the independent requests of a child with ASD while other studies focused on comparing it with different communication interventions.

Second, the mother and the RBT provided positive feedback about the effects and feasibility of PECS. There is evidence that PECS can be tough for parents to do correctly. Jurgens, Anderson, and Moore (2012) investigated the integrity to which parents and carers implement PECS in naturalistic settings, utilizing a sample of videos. Results of the study show that 61% of PECS exchanges contained errors in parent implementation. If parents could be successfully taught to implement PECS at home, children with ASD may be able to obtain more benefits from PECS training. Park, Alber-Morgan, and Cannella-Malone (2010) examine the effects of mother-implemented PECS training. Results show that training mothers to be primary implementers of PECS training is necessary and effective. These results show that it can be feasible for parents to learn to implement PECS at home with the proper training and support.

Third, the current study showed that it is possible to use PECS even with children who may have very limited interests. The participant in the current study showed little interest in tangible toys he had in his home, the use of an informal preference assessment helped find items and activities that would be motivating enough to use for PECS training session. Thus, prior to beginning intervention a preference assessment should be used to identify these items. Most studies reviewed indicate a preference assessment was used and aided in the PECS training sessions. Ganz et. Al. (2012) conducted a preference assessment to find preferred items and the

study showed that PECS positively impacted the participant's communication. In the current study an informal preference assessment was used and was effective in finding the right preferred items or activities for this study. Using the items identified throughout the pre-baseline condition were effective in increasing the participant's independent requests.

Implications for Practice

Findings from this study have implications for early childhood educators and parents. Early childhood educators and parents should consider PECS as a good fit for young children with ASD with limited communication. However, we emphasize that PECS training should be implemented correctly, following Bondy and Frost's PECS protocol, to see its effectiveness in children with ASD and limited communication. Furthermore, simply beginning PECS training sessions without a sense of what the individual's preferences or reinforcers are, can impact the intervention negatively. Findings show that using formal or in-formal preference assessments are beneficial prior to beginning PECS training. This will help ensure that the individual is motivated and reinforced by the items or activities used in training which in turn will positively affect the individual's communication. For this reason, it is important that a child's preferred reinforcers are identified prior to the start of PECS training. In this study, an informal preference assessment was conducted to figure out the most reinforcing and motivating items or activities to use for the study. In previous studies formal preference assessments were used. Therefore, it is recommended that practitioners either implement an informal or formal assessment to identify reinforcers before beginning implementation.

Limitations and Recommendations for Future Research

Despite the promising outcomes of the participant, there are a few limitations that could be addressed in future research. First, the PECS training sessions of the current study did not include all six phases of PECS, but only Phase 1. This is because the current study primarily

focused on teaching a mand or request response which may be most useful to young children with ASD who have no functional communication. It is uncertain if the individual with ASD could master all the other phases of PECS. In future studies, researchers might expand the PECS training throughout all six phases of the intervention. Second, the generality of the findings poses another limitation of the present study. The interventionists used for the current study had experience in the field and with the PECS protocol and had time to build positive rapport with the participants before the study started. It may be beneficial to generalize these skills to other people such as caregivers and other interventionists. All training sessions also occurred in the participant's home throughout the study which means it may be beneficial to generalize these skills to other locations such as in the community and school settings. So, to be able to generalize these results to a larger population and settings, future research needs to focus on a variety of individuals and locations to generalize skills learned throughout the study into other aspects of the participants life. Third, these PECS sessions were implemented 4 times a week with 2 to 3 sessions a day, which is not as frequent as the recommendation to provide as many opportunities to communicate (Frost & Bondy, 2002). It is important to give learners a variety of opportunities to communicate using PECS to ensure they are given as much practice. In the current study PECS training sessions were held in the home with two interventionists and only occurred during the participant's scheduled ABA services. In future studies, researchers might explore adding a parent training procedure to ensure the participant is given as many opportunities as possible to communicate using the PECS and is able to use it when interventionists aren't present and when the study concludes.

Visual Impairments Considerations

Children with disabilities and communication deficits struggle with developing functional speech and language skills. There has been extensive research on several approaches for teaching

augmentative and alternative communication (AAC) for children with limited speech (Lal, R., 2010; Agius, M., & Vance, M., 2016; Ganz et al., 2012; Dogoe, M., Banda, D., & Lock, R., 2010). The Picture Exchange Communication System is an aided AAC technique used to typically help individuals with autism develop functional communication skills. PECS is based on the understanding of the nature of individuals with autism spectrum disorders and how they develop their language and social interaction skills. This AAC device does not require verbal responses, instead it focuses on teaching individuals to request using few complex motor movements and no additional language such as sign language (Bondy and Frost, 2002). So how does one with a visual impairment use these AAC devices functionally? How can we accommodate and make changes to these AAC devices, so they are useful to individuals with visual impairments and other disabilities?

AAC techniques can be used to both understand communication from others and communicate more effectively to others. Because AAC devices usually involve visual media it can be particularly challenging to provide an individual with visual impairments and complex communication needs an appropriate AAC technique (Holbrook, McCarthy, and Hannan, 2017). Ivy, Hatton, and Hooper (2014) investigate the effectiveness of PECS using tangible symbols for teaching requesting to learners with VI and additional disabilities, for the purpose of their study they focused on the first two phases. Rowland and Schweigert (1989, 2000) coined the term tangible symbol and introduced it to students with VI and additional disabilities to help them make choices. Tangible symbols are “three-dimensional symbol that is permanent, manipulable with a simple motor behavior, tactilely discriminable, and highly representative of its referent (Holbrook, McCarthy, and Hannan, 2017). Referents are what the tangible symbols are meant to represent (examples, a place, person, activity, object, action, or idea). Tangible symbols can also

include real objects, partial objects, and artificially associated and textured symbols (Holbrook, McCarthy, and Hannan 2017). There's a lot of research to back up PECS effectiveness with a wide range of students but Ivy, Hatton, and Hooper (2014) aim to show its effectiveness when the PECS protocol and materials are adapted to the unique needs of students with VI. Participants for their study included four male students between the ages of 5 and 11. The students had severe visual impairments and functioned cognitively below a developmental age of 2 years. The materials for each trial included a tangible symbol for a preferred item placed on a table within the participants' reach. Each tangible symbol was created by the Adaptive Design Association (ADA) and placed on a tangible symbol holder. Each symbol was on a rectangular cardboard piece with a whole or partial object to represent the referent and was labeled in print and braille. Results of the study show that all four students learned to independently request using tangible symbols, students met criteria for Phase 1 within 7 to 14 days of instruction. For Phase 2 only two students reached mastery. The authors noted that the motivating value of reinforcers may have changes between Phase 1 and 2, so it is important to continuously do preference assessments to keep motivation high. Overall, this study showed the impact tangible symbols have on the development of basic communication skills for individuals with VI (Ivy, Hatton, and Hooper, 2014). Another study that focused on exploring the effectiveness of modifying the PECS instructional strategy to teach requesting to children with VI and ASD is presented by Lund and Troha (2007). Lund and Troha (2007) had three participants in their study who were blind, had severe language delays, cognitive impairments, met the state of Wisconsin Department of Public Instruction criteria for autism, had no hearing issues, and had no previous instruction in PECS. Tactile symbols represented preferred objects or activities and were mounted on a 3 x 3-inch square piece of cardboard and mounted with Velcro on a piece of

Plexiglas. A blank piece of cardboard was used as distractor symbol for baseline and the discrimination sub-phase of instruction. Sub-phases included, symbol exchange, distance and persistence, and discrimination. Results of the study show that only one participant completed all phases of the study. Due to a time constraint (30 intervention sessions) not everyone was able to get through all phases, but initial evidence shows that participants demonstrated progress with independent requests from baseline to intervention. It was also noted that their rate of progress was like some reports of sighted children using PECS and individuals with VI learning to use tactile symbols (Lund and Troha, 2007). Overall, the study shows evidence that supports the use of tactile symbols with instructional strategies adapted from PECS to teach individuals with ASD and VIs.

PECS modification can be done in a variety of ways and should be dependent on the individual's unique needs, whether it is a modification for their visual needs or their autism needs. Some of the modifications to PECS in the previous study are outlined in this paragraph and can be extremely useful when working with an individual who has an ASD diagnosis and a visual impairment. PECS procedure relies on a learner initiating communication by seeing the object they desire and uses the prompting hierarchy when prompting the individual for a communication exchange. The PECS manual suggests presenting items in a noisy manner or letting the individual interact with the item before taking it away (Frost and Bondy, 2002). Because some of the items chosen as reinforcers were not noisy enough and they believed it'd be confusing to give and then take away an item, Lund and Troha (2007) used an auditory cue. The cue, "Hi…, it's choice time" was used to indicate the researcher's presence and location and was designed to let the individual know it was time to make a choice about leisure activities. Another modification to the PECS procedure was seen in the prompting hierarchy. A modified least to

most hierarchy was used to steer away from prompt dependency. For the study's purpose, they also used verbal prompts, usually not used in standard PECS procedures. The verbal prompt, “give it to me” was used in place of the physical gesture which would be meaningless for the participants in this study. All participants progressed to independent responses regardless of the use of verbal prompting (Lund and Troha, 2007). In addition to this modification there are also other AAC techniques that would be most helpful to individuals with complex communication needs and visual impairments. These include gestures, tangible symbols, manual or tactile signs, and auditory scanning. Those who have low vision might also benefit from high-contrast photographs or line drawings and some may even use digital devices that produce speech output (Holbrook, McCarthy, and Hannan, 2017). Even though AAC and PECS relies heavily on visual graphic media, students with visual impairments and other disabilities have a range of options and techniques that can be modified to one’s unique needs to support their communication and language development.

Conclusion

Autism Spectrum disorder (ASD) is a developmental disorder characterized by deficits in social communication. Deficits in communication are correlated with other obstacles, including difficulties forming relationships with others, difficulty getting basic needs met, an inability to make choices and request for one's wants, needs, and desires. Findings from this study extend the existing evidence on PECS, demonstrating that PECS is an effective tool that increases the independent requests of an individual with ASD who lacked functional communication skills. Although this study focused on one participant, the results show promising effects of this AAC device on the communication of a child with ASD. Although the current study did not include a parent training procedure, social validity results and research demonstrates that caregivers would recommend its use to others, find the tool to be effective, and could implement PECS training with fidelity with the proper training and support (Park, Alber-Morgan, and Cannella-Malone, 2010).

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