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Using constant time delay to coach caregivers to teach their young children with Autism the picture exchange communication system within the early intervention setting

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Using Constant Time Delay to Coach Caregivers to Teach Their Young Children with Autism the Picture Exchange Communication System Within the Early Intervention Setting

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Abstract

Both Early Intervention (EI) and Picture Exchange Communication System (PECS) have been proven to be effective with children diagnosed with Autism Spectrum Disorder (ASD). A relationship between functional communication and behavior has also been noted and described. As individuals learn functional communication, challenging behavior decreases. Early intervention commonly uses PECS to teach children, specifically children with ASD, to communicate. Early intervention can come in different forms, ranging from very intensive daily services to weekly or biweekly visits from service providers. While the literature recommends early intervention, much of it is referencing intensive schedules that are not financially realistic or time sensitive to many families. Therefore, this paper aimed to research how to effectively teach the PECS procedure to caregivers of young children diagnosed with autism. Caregiver training was conducted within a local research center and reflected a typical early intervention schedule of services. Caregivers were taught using constant time delay (CTD) which is a common form of teaching within the world of applied behavioral analysis (ABA). Caregivers were also given a self-monitoring sheet to serve as a visual prompt to practice at home. The research aims to provide specific directions and guides for EI providers so that they can efficiently and effectively help coach families in the acquisition of the PECS procedure so that their child may develop functional communication without the necessity of an intensive schedule.

Keywords: autism, PECS, functional communication, early intervention, constant time delay, coaching

Introduction

According to the Vanderbilt Kennedy Center, evidence-based practices are highly recommended for maximizing growth and progress for individuals diagnosed with autism (n.d., p. 1). Research combining multiple practices needs to be conducted so that providers are able to support families with the most advanced and up to date research so that children can achieve as much progress as possible. The practices that need to be examined in conjunction with each other include functional communication using PECS, caregiver mediated strategies coached by early intervention providers, and proper ABA teaching procedures.

Early Intervention program providers work with families to provide professional support to achieve pre-set goals for children under the age of three who have a disability, developmental delay, or atypical development. Various providers such as Speech Language Pathologists (SLP), Developmental Service Providers (DSP), and Licensed Behavior Analysts (LBA) coach caregivers to implement evidence-based practices to promote growth in different areas of development including social-emotional, receptive and expressive language, cognitive, and fine and gross motor skills (Harrisonburg-Rockingham Community Service Board, n.d.). Service providers conduct 45 minutes to hour long sessions in the home or community anywhere from once a week to once a month, depending on the needs of each individual child and the schedule of the family.

Children diagnosed with ASD are highly likely to receive services through early intervention. According to the National Autism Association, autism is the fastest growing disability and affects 1 in 59 children. Of those diagnosed with ASD, “about 40% […] do not speak [and] about 25%–30% have some words at 12 to 18 months of age and then lose them” (National Autism Association, n.d. p. 1). Due to the growing number of children diagnosed with

autism and the percentage that are considered to be nonverbal, service providers need evidence-based practices to teach children functional communication skills. EI providers typically coach caregivers to promote the use of sign language, Alternative and Augmentative Communication (AAC) applications on tablets, or Picture Exchange Communication System (PECS) so the children can communicate their wants and needs.

According to Peters-Scheffer (2013), Early Intensive Behavior Interventions (EIBI) produce significant gains in behavior, specifically cognitive, social and communicative, and challenging behavior, through the use of Applied Behavioral Analysis (ABA). EIBI can range anywhere from 20 hours to 40 hours a week based on the severity of behavior and needs of each individual child and are an Evidence-Based Practice (Wong et al, 2014). While overall effective, the intensity and frequency of sessions conducted within EIBI is not an actuality for all families that have young children with ASD. However, Early Intervention has also been determined to be beneficial for children diagnosed with ASD and produce developmental progress (National Autism Association).

Early Intervention services are provided to children from birth up to the day before their third birthday that have a developmental delay, atypical development, or a disability as determined through eligibility screenings (U.S. Department of Education, 2016). As addressed in the Individuals with Disabilities Education Act (2018), services are provided on an individual basis and the frequency and intensity of duration is provided “to the maximum extent possible, in natural environments” (US Department of Education, 2011, p. 1). Services typically range from once a week for an hour to once a month for an hour depending on the professional opinion of the designated service provider. EIBI schedules are more intensive, ranging from 20 to 40 hours

a week for 1-4 years (ASD Resources and Community, 2015) and cost, on average, $40,000 annually (Chasson et al. 2007).

Combining the techniques from ABA that have been utilized in EIBI, early intervention providers could effectively coach parents in order to potentially achieve similar results in children with autism. Specifically, providers could use strategies to support caregivers in teaching young children functional communication. This can especially be applied when teaching the PECS procedure since there are several phases and various responses caregivers would need to learn in order to sufficiently acquire the skills to implement the procedure with children without the guidance of a service provider.

Purpose of this Study

The purpose of this study was to examine how to efficiently teach two caregivers how to implement PECS within the context of Early Intervention services. Specifically,

- How can early intervention providers effectively coach caregivers so that they can teach children with ASD to develop functional communication through the use of PECS?
- How can providers use ABA teaching strategies to effectively coach caregivers with limited time constraints?
- Do the caregivers find the use of CTD to teach PECS to them acceptable?

Literature Review

Definition of Terms

Picture Exchange Communication System (PECS): "aims to teach spontaneous social-communication skills by means of symbols or pictures and teaching relies on behavioral principles, particularly reinforcement techniques" (Howlin, Gordon, Pasco, Wade, & Charman, 2007, p. 1-2).

Early Intervention: "involving parents in behavior management and promotion of communication skills which are non-intensive, utilizing teaching within everyday situations" (McConachie & Diggle, 2006, p. 121). Specifically developed for children between birth and age three with a developmental delay, disability, or atypical development.

Coaching: "include opportunities for the caregiver to try out a strategy in a real-world context with differentiated support from the provider. The provider guides a caregiver as they work with the child, practicing strategies, using or adapting materials, or increasing opportunities. The provider offers specific recommendations or suggestions in the context of the routine to help the caregiver implement the strategy or maintain the child's engagement and participation" (Friedman, Woods, & Salisbury, 2012, p. 69).

Functional Communication: "forms of behavior that express needs, wants, feelings, and preferences that others can understand. When individuals learn functional communication skills, they are able to express themselves without resorting to challenging behavior or experiencing communication breakdown" (American Speech-Language-Hearing Association, 2018, p. 1).

Constant Time Delay (CTD): "prompting strategy that can be used to effectively teach a variety of skills or tasks. CTD prompts have two levels: a) the 0-second delay and, b) the set or constant delay trials. With CTD prompting, one prompt is used (it does not change); rather, the time (or delay) when a prompt is delivered changes" (Grattan & Demchak, 2016, p. 1).

Background on Early Intervention and the Effects on ASD

Research conducted by Smith (1999) and Peters-Scheffer (2013) has shown that behavior analytic early intervention programs can produce improvements in various forms of behavior in children diagnosed with ASD. While there are a variety of factors that can contribute to the degree of improvement, implementing a program plan early can lead to long lasting results (Smith, 1999). While Smith (1999) identified issues in the scientific methodology in early intervention programs, Peters-Scheffer (2013) categorized and identified early intervention programs with solid scientific methodology that have been shown to produce clinically significate gains in children diagnosed with ASD. The meta-analysis examined both intensive and low intensity early intervention programs and found both to be effective. The research also reported that families struggled with EIBI due to financial challenges, finding effective teams, and time constraints. These concerns and challenges are what led to the examination of low intensity intervention programs. Further research should be conducted to examine the potential correlation between level of severity on the ASD spectrum with level of intensity needed of early intervention programs.

Learning Theories

According to Sharan B. Merriam (2001, p. 3), there is "no one theory or model of adult learning that explains all that we know about adult learners, the various contexts where learning

takes place, and the process of learning itself." However, Merriam does address a common pillar of Adult Learning Theory, which is Self-Directed Learning (SDL), and the accompanying goals of that pillar. According to her research, SDL includes learning objectives that have been chosen by the adult learner (2001). This theory is the foundation of early intervention because providers only make goals based on the interests of the family.

Adult Learning Theory is the focus for Early Intervention, but the principles of Applied Behavior Analysis will be used to teach adults within the study. As described by Cooper, Heron, and Heward (2014, p. 28), "the objective study of behavior as a natural science should consist of direct observation of the relations between environmental stimuli (S) and the responses (R) they evoke." Therefore, learning is dependent on the antecedents and consequences of any given behavior which can be influenced and manipulated by the researcher. ABA researchers use hierarchies of prompts to elicit correct responses which they then reinforce in order to teach new behaviors. Over time, the prompts are faded so that the desirable responses independently occur (Cooper, Heron, and Heward, 2014).

Background on the Best Practices within Early Intervention

As discussed, early intervention is effective when properly implemented and conducted by trained professionals. As the field expands, more research has been conducted to properly analyze what components of early intervention are the most effective and what providers should do to ensure caregivers can independently carry out procedures and strategies. Early intervention is primarily focused around coaching caregivers in order to ensure this possibility. Friedman, Woods, & Salisbury (2012) established operational definitions of coaching in order to train and provide professional development for those working in the field so that session time can be better utilized and become more effective. As discussed in their research, coaching is guided by the

adult-learning theory and is most effective when applied to real life contexts that is the most relevant for the family. Providers within early intervention teach strategies to caregivers and then allow caregivers to practice these strategies while the early interventionists provide guidance and feedback as needed. Using an operational definition of coaching, Early Intervention programs can train providers to effectively coach caregivers during sessions which would positively impact the progress of families of children with ASD (Friedman, Woods, & Salisbury, 2012).

While coaching has been operationally defined, it has not yet been universally accepted or used within the field of early intervention. However, most programs have their own idea of what coaching is which typically falls on a spectrum of caregiver-provider interactions and procedures to meet each family's set of goals for a child. Kemp and Turnbull (2014) synthesized the research on coaching families in natural settings, documenting its usage and outcomes. Before 2000, coaching was used 0.4% of a session while the provider worked with the child at least 50% of the time and asked questions about 24% of the time (Kemp & Turnbull, 2014). This format of early intervention was more similar to clinical settings, except the early intervention services occurred in the home. With the transition into coaching, the early intervention provider now became responsible for teaching strategies to families that could then be accurately and effectively utilized when the therapist was away. Coaching is now a key characteristic of early intervention; therefore, it is important to understand what coaching is and what the outcomes are as demonstrated by Kemp and Turnbull (2014). According to the research, both parent and child outcomes were reported as positive and showed gains compared to pre-intervention levels. Coaching led to caregiver mastery of intervention strategies that in turn led to developmental gains for each child (Kemp & Turnbull, 2014).

Background on Functional Communication, PECS, and the Effect on ASD

Impaired and delayed communication has been connected to an increase in challenging behavior due to an individual's difficulty to communicate his or her wants and needs functionally. This is a common characteristic of people who have been diagnosed with ASD (ASD Society, 2016). Teaching functional communication skills can therefore potentially lead to decreased challenging behavior and increased appropriate communication. Picture Exchange Communication System (PECS) is an intervention used for functional communication training. PECS was specifically developed for individuals who have difficulties with speech production and communication. PECS is frequently taught and used with children and adults with ASD. In a multiple baseline design, Charlop-Christy, Carpenter, Le, LeBlanc, and Kellet (2002) examined the acquisition and effects of PECS with three children diagnosed with ASD. According to their results, PECS acquisition led to increases in speech communication and decreases in problem behavior. Within the study, PECS training occurred twice weekly as 15-minute training trials by therapists. Participants reached mastery of all PECS phases with a total of 224 to 276 trials, depending on the child (Charlop-Christy, Carpenter, Le, LeBlanc, & Kellet, 2002).

Background on Caregiver Mediated PECS Training

Studies have been conducted with teachers within their own classrooms. Howlin, Gordon, Pasco, Wade, and Charman (2007) conducted a study that provided a two-day PECS workshop for teachers. Teachers were then also provided an additional six half-day consultations by experts that visited the teachers' classrooms once a month to teach PECS to school children with ASD. The results indicated modest effectiveness of teacher training with an increase of initiations and picture usage by the students. However, the effects were not maintained once the consultations had ended, which indicates a need for better training. Homiltas, Rosales, and Candel (2014)

further examined how to train staff to teach PECS to students with ASD within the classroom. The study focused on procedural integrity in conjunction with effective training of teachers. The results found that teachers could meet mastery levels that maintained when the experimenters conducted follow-up probes.

With the extensive research supporting the use of PECS as a form of functional communication training for children diagnosed with ASD, additional research has expanded to focus on family mediated PECS training. Chaabane, Alber-Morgan, and DeBar (2009) examined the use of procedural checklists as a training procedure to teach two mothers of sons diagnosed with ASD to use PECS. The mothers trained their sons within their own homes after they had been trained by the experimenters to implement PECS. The research established a relationship between increased requests using PECS and the parent-mediated PECS training. Chaabane, Alber-Morgan, and DeBar (2009) used a procedural checklist to teach PECS training, Howlin et al. (2007) used workshops led by professionals in conjunction with consultations, and Homiltas, Rosales, and Candel (2014) used Behavioral Skills Training (BST) to train educators. BST "involves providing a description, both verbal and written, of the target skill to be taught, demonstrating the target skill, having the trainee practice that skill, then providing feedback. These steps are completed until the trainee acquires the skill to mastery" (DeClaire, 2017). Differences in instructional formats may play a role in whether or not professionals mastered PECS and maintained those skills over time.

The combination of results from the various studies regarding PECS training to non-professionals, such as teacher and caregivers, indicate a need for research-based training for non-professionals, specifically caregivers, when teaching PECS to children with ASD so that effects can be maintained when the non-professionals are no longer receiving training from

professionals. BST is an example of an evidence-based practice but is also time consuming and intensive.

Background on Constant Time Delay, ABA Teaching Strategy

Another evidence-based teaching strategy that is less intensive is constant time delay (CTD). According to Wolery, et al (1992) Constant Time Delay (CTD) was effective for 97.7% of individuals it was used with. Their research also shows that CTD produces rapid learning with minimal errors and is effective with individuals with various demographics, in different settings, and with different instructional set-ups formats. Additional research has since been conducted to evaluate the use of CTD to teach chained skills to adults so that they can then teach additional skills to others. Wall and Gast (1997) conducted a study to examine the effectiveness of using CTD to teach adults how to use CTD to teach chained tasks to individuals with disabilities. The results show that caregivers can be both learners and teachers of chained skills if adequately trained by professionals and the skills can be maintained after training has ceased. This study demonstrated that evidence-based strategies can used to teach caregivers how to become effective interventionists in the absence of professionals (Wall & Gast, 1997). Britton, Collins, Ault, and Bausch (2017) further examined using CTD to train paraprofessionals to teach a variety of skills, both discrete and chained, to students with disabilities. The results show that CTD was effective when used to train the adults to effectively teach different skills to students.

Self-Monitoring Effects

Self-monitoring is most researched form of self-management and is a “procedure whereby a person observes his or her own behavior systematically and records the occurrence or nonoccurrence of a target behavior” (Cooper, Heron, and Heward, 2014). According to the

Vanderbilt Kennedy Center for Research on Human Development (2013), self-monitoring "can be used in virtually any instructional setting […] and may result in gaining the skills and confidence to navigate learning responsibilities more independently." According to Nelson and Hayes (1981), self-monitoring is composed of two stages, determining that the target behavior has occurred and recording the occurrences for the target behavior. Furthermore, Nelson and Hayes (1981) determined that, "self-recording responses […] serve as cues to remind the person of the external environmental consequences that actually control response frequency." Self-monitoring has been used to increase attention, accuracy, and productivity (Maag and Reid, 1993), increase treatment integrity (Mouzakitis, Codding, and Tryon, 2015), and conduct self-directed behavioral family interventions (Sanders, Markie-Dadds, Tully, and Bor, 2000). Research also demonstrates that self-monitoring can be taught and utilized to promote treatment fidelity of behavioral plans being implemented by families (Sanders, Markie-Dadds, Tully, and Bor, 2000) and is a source of providing data and increasing response frequency due to reactivity (Nelson and Hayes, 1981).

Research Gap

Early Intervention, caregiver-mediated PECS, Constant Time Delay, and self-monitoring have been systematically reviewed and accepted by the scientific community as effective practices for children with ASD. However, these strategies are typically used by professionals to teach skills to clients and are implemented independently of each other rather than being used together as a multi-component intervention. There needs to be research that bridges the gap between professional resources, training, and early intervention so that caregivers can be effective teachers to children with ASD. There is limited research that demonstrates how to train caregivers to be the primary teacher of skills for children with ASD. Past research primarily

utilized time intensive formats with families which is not always feasible due to the caregivers' conflicting work schedules, socioeconomic status of the family, and children's incompatible daily activities. Professionals need to be able to help families within the low intensity early intervention setting which is a commonly how families with young children with ASD access services. Research should focus on the most effective way to teach PECS to caregivers so that they can teach it to their children when they are only receiving limited training sessions. Based on the available research, CTD may be an effective means to accomplish this task.

Method

This paper discusses the method and design to used research the effects of Constant Time Delay (CTD) to teach caregivers the Picture Exchange Communication System (PECS) procedure. The researcher planned to teach PECS up to Phase 3a, dependent on the progress of each family. Caregivers were coached through the phases, so they could then implement it with young children up to the age of three that have been diagnosed with ASD in order to promote functional communication. This research has included Phases 1 through 3a in the case that a family, both caregivers and child, progressed and mastered Phase 1 and was able to move on to the next Phase. The paper includes a description and justification of the sample, data collection instruments, data collection procedures, and analysis of the data. Lastly, the paper identifies and describes internal and external validity, reliability, generalizability, and limitations.

Participants and Setting

The sample was based on the availability of potential clients within the area. No one specific school, district, or organization was targeted. However, there were certain requirements for participation in the study and were as follows:

- A caregiver of a child diagnosed with ASD aged three years or younger, or a child that displays characteristics consistent with ASD but not diagnosed, or a child with a significant speech delay.
- English speaking families
- Little to no prior exposure to the PECS procedure for both caregivers and children
- If prior exposure, child should not have displayed PECS skills at any phases

Informational packets were sent home to families that have young children with ASD or characteristics of ASD or had a speech delay. The family was found through a Facebook group after a brochure had been given to a local inclusive preschool program which was then posted online by an outside source. The family was a part of the Facebook group and independently contacted the researcher after seeing the brochure. Participation was completely voluntary, and lack of participation had no effect on services rendered or provided through the preschool program.

Each session was originally planned to be conducted in the home and in the most comfortable room as chosen by each family. This was to promote caregiver choice so that they were as involved in the decision making as possible. Quiet places within the home with space suitable for everyone involved was going to be suggested by the researcher to guide the caregivers in making their decision. However, sessions actually occurred in a local research clinic as preferred by the caregivers that participated.

One participant was recruited for this study. Carl was a 2.5-year-old boy diagnosed with ASD. He produced inconsistent vocalizations but did consistently sign for more. Caregivers shared that he engaged in various challenging behaviors that they believed was related to his lack of communication. These behaviors included hitting, biting, head banging against the wall, and screaming. The caregivers tried to teach additional signs but only the sign for more was used consistently. Upon diagnosis, doctors recommended both PECS and Early Intervention services to the family. The researcher assessed Carl's verbal repertoire using parts of the VB-MAPP in order to focus on Carl's requesting skills. Carl's results are shown in Appendix A.

Each session was conducted at a local research and clinic facility that had cameras set up within the room. This location was chosen based on convenience, preference, and location to the

mother's work. The researcher offered in-home services, but the family preferred this setting because they believed it to be easier. Each session lasted for one hour and was conducted each Wednesday at 2:30 in the afternoon.

Description of the Data Collection Instruments

Prior to data collection, Phase 1 through 3a of the PECS procedure was task analyzed in order to objectively and accurately take data to determine whether the procedure was implemented correctly or incorrectly. The task analysis (TA) allowed the researcher to also determine what steps of the PECS procedure each caregiver performed correctly or incorrectly. Once the task analysis was developed, the researcher collected baseline measurements and then began implementing the CTD and monitored progress based on the data. Once the CTD teaching procedure had commenced, data was collected on a sheet that indicated whether or not each step was performed correctly or incorrectly and if it was performed before or after the controlling prompt. Using a data sheet, in conjunction with a task analysis for a chained task, allowed the researcher to ensure the data was collected using a reliable and valid measure because each step of the PECS procedure was operationally defined. This allowed the researcher to definitively know if the caregiver correctly or incorrectly completed the step. Furthermore, the controlling prompt was administered based on a set lapse of time (e.g., 2 s), so the researcher knew whether or not the response occurred before or after the prompt and that the time lapse was always the same. The controlling prompt was a direct verbal prompt that stated the step that the caregiver needed to complete. Using a direct verbal prompt was consistent with the coaching method used within Early Intervention. Indirect verbal prompts are not typically used with the coaching process because caregivers need to quickly know what to do and then perform that skill in order to prompt the child to perform a particular response. Furthermore, EI providers consistently use

direct verbal prompts so the research design reflected what providers were already doing. Appendix B shows the data sheets that reflected a task analysis of phases 1 through 3a. Phase 1 was broken down into four TAs to incorporate backward chaining to promote independent picture trades. Phase 2 was broken into three TAs to reflect and promote independent picture trades with distance and persistence.

Data Collection Procedures

The data was collected every session and a new sheet or row within the sheet was used for each trial. A plus sign was used to indicate a correct response and a – sign was used for an incorrect response. If no response was emitted, then the researcher wrote NR in the space provided. The sheets were modified to reflect a task analysis of the PECS procedure and included a controlling prompt to reflect what type of prompt was needed to evoke a response and if the response was before or after the prompt. The controlling prompt was a direct verbal prompt that states the step of the TA.

Throughout the sessions, the data was graphed to visually display the progression of correct responses of both caregivers before the prompt, as well as probe data of the child. This was displayed using a double line graph, one line showing percentage of correct responses for the communicative partner and one showing percentage of correct responses for the helper. CTD, and thus data collection, continued even when criteria for caregiver mastery had been reached. Caregiver mastery was reached when 100% correct responses occurred for two consecutive sessions with all correct responses occurring before the controlling prompt. CTD for that Phase ceased when mastery of that phase had been reached for the child. This was demonstrated through probe sessions, discussed elsewhere. Both caregivers and child then moved on to the next PECS Phase.

The researcher planned to graph the frequency of trials conducted at home as reported using the self-monitoring sheets, as seen in Appendix C, in order to compare across participants to determine if there was a potential correlation between frequency of home trials and rate of acquisition of both the caregivers and the child. However, since there was only one family that participated within the study, this information was not graphed because there was no other data to compare it to. However, the self-monitoring sheets were examined with the family to discuss potential reinforcers that were used at home and whether or not different items needed to be chosen.

The social validity survey, displayed in Appendix D, was given to the family at the end of the last session. The researcher left the room and instructed the family that they may leave once they are finished and can leave the survey on the table within the room. The family was also notified that the survey was not a requirement and may leave without completing it.

Description of the Research Design

As previously stated, the purpose of this research was to examine the effects of CTD as a method to teach caregivers to implement PECS with their children diagnosed with ASD or children displaying characteristics consistent with ASD. The research design was quantitative, and data was collected through observation of the video recorded sessions. The researcher planned to conduct a single case design, specifically a concurrent stacked A-B design in order to study the individual effects across participants independent of each other. Given the nature of Early Intervention, the design was also similar to a multiple probe design since sessions were not going to be on consecutive days or within the same day. However, data was collected for every session and throughout the whole session. Due to limited participants within the study, the researcher only implemented an A-B design. Each session also had at least five trials. Probe

trials were conducted every two weeks to determine if the child was independently using the PECS procedure. The child's behavior was not continuously measured due to resource constraints. The researcher was coaching and collecting data on the caregiver and was therefore unable to also collect data on the child for every session. The researcher planned to conduct a multiple stimulus without replacement (MSWO) preference assessment at the beginning of each session to identify what items, activities, or edibles are the most reinforcing for the child. However, due to challenging behavior of the child, a free operant preference assessment was used. Furthermore, self-monitoring sheets were given to the family to serve as a visual cue to practice the PECS procedure at least five times a day and function as simple data collection of which reinforcers were being used outside of sessions.

The research answered the following questions:

- How can early intervention providers effectively coach caregivers so that they can teach children with ASD to develop functional communication through the use of PECS?
- What ABA teaching strategies can be used to effectively coach caregivers with limited time constraints?
- Do the caregivers find the use of CTD to teach PECS to them acceptable?

The researcher was able to quantitatively answer these questions by providing data that explicitly showed the effectiveness, or lack thereof, of CTD on the acquisition of the PECS procedure within the Early Intervention (EI) setting or one with a similar setting and session schedule. Using a single case design allowed the researcher to implement the procedure to multiple individuals, although not at the same time, and analyze the data of individual responses and the changes that occurred over time, specifically looking for any proof of learned behavior.

A study conducted by Wall and Gast (1997) studied the effects of using CTD to teach adults how to use CTD to teach clients with intellectual or developmental delays various chained skills. This design used a similar structure to teach the procedure and collect data on the implementation of the procedure. This design also utilized a similar data collection sheet to record caregiver responses throughout each session. However, this study did not explicitly teach caregivers how to implement and run a CTD procedure.

Procedure

Baseline of caregivers' PECS implementation skills was assessed within the first session with multiple trials conducted. The researcher conducted the preference assessment. The researcher used the task analysis of PECS Phase 1 and directed the caregivers to try their best to initiate and finish a picture exchange with their child with each of the items used in the preference assessment. When collecting baseline for Phase 2, the caregivers were directed to try their best to initiate and complete a picture exchange when they were at a distance from the child. When collecting baseline for Phase 3, the caregivers were directed to initiate and complete a picture exchange using two pictures. The caregivers were informed that the researcher was looking to observe what the caregiver would naturally do prior to any intervention, and therefore, they were not given any additional information about the phases or how they were different. If caregivers were confused with the verbal direction, the researcher clarified that the caregivers should do what they usually do, or what comes natural to them, to use a picture as a form of communication with their child. This explanation was repeated and applied with the additional component of being at a distance from the child and using two pictures instead of one for the trade. Since there are multiple TA versions for Phases 1 and 2, baseline was only collected for the first version of the TA for Phases 1 and 2 due to time constraints. There was only one TA

version of Phase 3 which was used for baseline collection. Once baseline was completed, the researcher moved onto the intervention. Although this was only for one day, it included five trials of data points. This format also accurately reflected the Early Intervention setting. After baseline was completed, the researcher discussed the outline of the intervention and what each session looked like with the caregivers to answer any questions and discussed their concerns. A probe trial was also conducted between the researcher and the child to assess whether the child could independently trade a picture icon or not when the icon was in view and the researcher interacted with a preferred item. This served as the baseline probe for the child. Every two weeks, the researcher conducted another probe at the beginning of the session to monitor acquisition. The researcher recorded a + for an independent picture exchange and a – for any other response.

Prior to implementing the intervention sessions, the researcher was going to conduct an MSWO preference assessment with the child. In typical EI settings, the professional would coach the family through this process. However, for the purpose of the research, the researcher conducted the preference assessment and the caregivers were not expected to implement the preference assessments in session or out of session. For the MSWO, the researcher planned to discuss what toys, activities, and/or edibles the child seemed to enjoy and play with the most and then use these in each preference assessment. Dependent on how many options each family came up with, the researcher was going to use the corresponding data sheet from Vanderbilt's Evidence-Based Practices webpage (2018). The data sheets included versions for five, six, or seven putative reinforcers for the preference assessment. The researcher was going to sit across from the learner, on the floor or at a table, and line up toys blocking them from the view of the child. The researcher was then going to allow the learner to see all their options and ask them

"which one do you want?" Once the learner had chosen an item, the researcher was going to record which item was chosen and the placement it was in, in comparison to the other toys, on the data sheet. The researcher was then going to allow the learner 30 s to interact with the item or eat the item if using edibles. The researcher would then retrieve the item and remove it as an option to choose, rearrange the remaining items out of sight, and again ask the learner what they wanted. This process was going to be repeated until there were no more options left. If the learner attempted to choose more than one item, the researcher would block the learner and tell them to choose one item. However, during the first session, the researcher observed that the child would not scan the items and choose one as a preference. The researcher then attempted to conduct a paired-stimulus preference assessment, where two items are offered to the child and the researcher recorded which one they chose. However, the child did not consistently make choices and would attempt to choose items that were out of reach. Due to this, the researcher decided to use a free operant preference assessment for the first ten minutes of the session. Items, activities, and snacks were available on the table within the room. The researcher then recorded the duration the child interacted with each item. This preference assessment was conducted prior to intervention for every session to account for satiation and use the most reinforcing items for that day as the child's interests change. Only small amounts of edibles were available during the free operant preference assessment so that they did not become satiated with that item. For the days in between each session, the caregivers were supposed to us the results from the prior session's preference assessment to conduct their trials independently. Appendix E displays the three options for the MSWO sheets based on total amount of options offered that were going to be used, a paired-stimulus preference assessment data sheet that was attempted, and the free operant preference assessment data sheet. The preference assessments revealed a stuffed shark, a

fish bowl with fish, and a dog blanket to be the top three preferred items. This was consistent across sessions, so the corresponding picture icons were used. The picture icons were real pictures of the items, made by the researcher and were 2 in by 1.5 in, in color and laminated with a hook and loop fastener on the back. Caregivers also shared that they used snacks during regular mealtime since Carl was highly motivated to request them. Snacks included chocolate cookie sandwiches, peanut butter cookies, and veggie straws.

The researcher gave a weekly self-monitoring sheet to caregivers so they could be visually prompted to conduct trials outside of sessions and record what was used for those trials. This data was not graphed. The goal on the self-monitoring sheet was to conduct at least five trials per day with the child. This sheet was primarily used as a visual support for the family to practice outside of sessions. At the end of the research design, the data was supposed to be reviewed to determine if there was a pattern related to increased outside of session practices and rate of mastery for both caregivers and children. However, this was not the focus of this design.

When conducting the CTD, a 0 s interval was implemented for two consecutive EI sessions, which were one week apart, each session included a minimum of five trials. The researcher used a direct verbal prompt (e.g., sit across from the learner with their preferred reinforcer) as the controlling prompt which stated the step for the caregivers. To conduct the CTD0, the researcher asked the caregivers if they were ready to begin the first trial. Upon confirmation, the researcher directed the caregivers to determine who will be the communicative partner and who will be the helper for the entirety of the research. The communicative partner is the caregiver that entices the learner with their preferred reinforcer and reinforces the picture exchange. The helper is the caregiver who will provide physical prompts as required per Phase with no other interactions with the child. The researcher then directed the caregivers to choose a

potentially highly reinforcing item and the corresponding picture icon. The researcher then told the communicative partner to sit across from the learner and the helper to stay behind the learner. Since this phase has a 0 s time delay, the researcher immediately directed the caregivers through each step of the TA for that phase. The researcher used a direct verbal prompt as the controlling prompt which stated exactly what the caregivers need to do. Once the CTD0 phase had been implemented for two consecutive sessions, the researcher implemented a CTD procedure with a 2 s time interval. This interval was chosen because each step of the PECS procedure, per Phase, needed to occur as immediately as possible to promote the child's acquisition of the procedure. Praise and positive gestures and looks, such as smiles and thumbs up, were delivered contingent on correct responding. After each trial, the researcher provided feedback to the caregivers on their performance. The feedback component also provided the child with time to engage with the preferred item they had been prompted to trade the icon for. To conduct the CTD2 procedure, the researcher had planned to ask if the caregivers were ready to begin the trial. Upon agreement, the researcher directed the caregivers to begin. After 2 s, if the caregivers had not yet performed the target response, the researcher gave a direct verbal prompt which stated exactly what the caregivers needed to do. This was repeated for each step of the TA. Every two sessions, the researcher conducted a probe trial to monitor the progress of the child using the PECS procedure. Once criterion had reached mastery for Phase 1, the process was repeated for the following Phases. Mastery was reached when the caregivers completed the steps of the TA with 100% independence for two consecutive sessions as well as when the child had demonstrated 100% independence of the Phase for 2 consecutive probe sessions. Data was collected for both caregivers and their respective steps of the TA.

The researcher planned to conduct a maintenance probe three weeks after the cessation of data collection. The maintenance probe was to assess the caregiver's PECS implementation skills for the last PECS phase in which the caregiver achieved mastery. The researcher also planned to initiate a picture exchange to probe for the child's PECS usage mastery based on their phase and for generalization. Each probe was planned to only be one trial. This process was dependent on what Phase the child last mastered. The researcher was also going to set up the environment to reflect the Phase of PECS the child last mastered. For Phase 1, the researcher would have interacted with the preferred item while across from the learner with the picture icon in view. For Phase 2, the researcher would have interacted with the preferred item at least two feet away from the learner and the picture icon is also at two feet away from the icon. For Phase 3a, the researcher would have interacted with two items, one preferred and one non-preferred. The child was expected to independently trade the correct corresponding picture icon. This probe would have served as an indication if the child was performing the skill independently or not which is why physical prompts were not needed. Level of prompting needed was not being tested during this probe but rather full independence of the skill. The maintenance probe was supposed to be collected and recorded in the same format as the probes throughout the intervention phases. However, due to time constraints a maintenance probe could not be collected to determine if any skill acquisition maintained.

Reliability

IOA was conducted using interval-by-interval IOA for 100% of baseline and intervention sessions, with each step representing an interval. The aforementioned datasheets for baseline and intervention were also used for IOA. IOA for the intervention sessions was planned to occur every three weeks, with caregiver consent for the secondary observer, a graduate

research assistant, to review the video footage. However due to limited sessions, IOA was collected for every session. IOA for baseline and CTD0 phase of intervention were at 100%. The researcher never implemented CTD2 phase of intervention due to time constraints. The formula used was

(Number of steps agreed/ number of steps agreed + number of steps disagreed) X 100

Each element of the intervention was broken down into individual components and had been operationally defined in order to promote procedural integrity. The researcher originally planned for procedural integrity to be collected every three weeks, accounting for 33% of intervention sessions. However, since there were limited sessions, procedural fidelity was collected for 100% of sessions. The procedural fidelity checklist for both CTD0 and CTD2 are shown in Appendix F. Procedural fidelity for both CTD0 and CTD2 for intervention were at 100%.

It was planned that after probe sessions for maintenance were completed, the researcher was to ask the caregivers to fill out a social validity survey. However, due to time constraints, the survey was given after the last CTD2 intervention session. The survey was composed of nine questions addressing how comfortable the caregivers feel implementing the PECS procedure and whether or not they believe the study made an impact on their child. This survey was adapted from Ju Hee Park's 2009 dissertation.

Description of the Data Analysis

The researcher visually analyzed the double line graph to determine if the PECS procedure had been learned and how long it took to learn for each individual to reach criterion. Visual analysis is a form of graphical analysis used within Applied Behavior Analysis and includes an inspection of the axis and data paths, determining if there are any data that are

outliers, and recognizing when condition or phases changes occurred and what those changes are. Furthermore, the visual analysis determined what the level of the data were, whether the data is stable or variable, if there was a trend in the data and what the trend was and observing the change in data across points of transition. Once this was done, the researcher continued with the visual analysis by comparing the data within conditions as well as across conditions, reexamining the above components for each. Lastly, the researcher drew conclusions based on all of these components together. This visual analysis allowed the researcher to determine if CTD was effective for teaching parents to use the PECS procedure and how many CTD sessions were required to teach the PECS procedure when taught on the Early Intervention setting.

Discussion of Internal and External Validity, Reliability, Generalizability, and Limitations

Conducting a visual analysis of the data allowed the researcher to determine if the change in data can be attributed to the systematic manipulation of the independent variable. After conducting the visual analysis, the researcher could have demonstrated a high level of internal validity if the measurement of behavior in the intervention phase, percentage of correct responses before prompts, improved from the baseline measurements but only after the intervention had begun. Since the research studies a learned behavior, the design did not return to baseline because the behavior would be very unlikely to return to baseline measurements. This could have been another chance to showcase internal validity, but it was not a realistic option for the type of research being conducted.

To further eliminate the threats to internal validity, the data was recorded by the researcher as well as an additional graduate assistant, after that person had been properly trained, every three weeks. The data was collected based on operational definitions so, if properly

trained, there should be no issues with instrument decay, instrumentation, or data collector characteristics, especially if the outsider was not invested in the research like the researcher is.

While single case designs are typically known for lack of external validity or generalizability, that was not necessarily true partly due to a lack of understanding of what single subject designs are. Single subject designs do not only use one subject, they just use the subject's baseline measurements as a control, meaning they investigate within subject changes. Most single subject designs have three to five subjects within the experiment regardless of the experimental design being implemented. Therefore, single case designs can show generalizability since there is more than one subject, however, the external validity is not as strong as other designs. To further the external validity, the study needs to be replicated which should occur for all experiments.

While the researcher could not guarantee that a caregiver will consistently get certain steps correct because that is based on caregiver actions, they did have a high level of confidence that each action will be recorded consistently. Using operational definitions for each step accurately allowed the data recorder to determine if a response was correct or incorrect and when the response occurred in relation to the prompt. Either the response was correct or not, there was no argument about if anything technically counted because the data recorder was already trained based on the definitions for each step. Furthermore, using a time lapse with observation allowed the data recorder to easily determine if the response was before or after the controlling prompt. A second independent observer also collected data for 100% of sessions and calculated independent observer agreement (IOA). Therefore, the data collection and IOA of 100% of sessions had a high level of reliability.

If the research demonstrated a relationship between the use of CTD and the acquisition of the PECS procedure for caregivers, the study may still be limited to the demographic of the caregivers involved. However, no set demographic background was necessary to participate in the research. This meant that caregivers varied in age, socioeconomic status, relationship status, education background, race, etc.

Description and Justification of the Methods of Analysis

Applied Behavioral Analysis (ABA) mostly uses single case designs because it allows the researcher to implement experiments and identify individual changes. It is imperative to identify individual changes when researching because averages tend to conceal important information that leads to understanding the true effectiveness of the independent variable within the research. The stacked A-B design would have allowed the researcher to review the results across participants to determine if the changes were consistent and replicated, and if CTD may be effective to teach the PECS procedure. The data sheet was objective and accurate, as well as the graphs that accompanied it to visually showcase the results of the study.

Protection of Human Subjects

All subject information was kept confidential in compliance with the Health Insurance Portability and Accountability ACT (HIPPA) when working with outside programs. Information was not shared with the researcher without the written permission of the family the study was offered to. The researcher was not made aware of who the study was offered to but declined. The researcher only came into contact with information of the caregivers who willingly agreed to participate via written signatures. Participants could have pulled out from the experiment at any time with no repercussions. Approval from James Madison University's International Review

Board (IRB) was required to conduct the study which further protected the rights of those participated in the study.

Results

Procedural Implementation

Due to caregiver preference, sessions were conducted once a week at a local research clinic. In order for both caregivers to attend at an appropriate time, it was more convenient to travel to a local research center than to the home of the family. The family signed the release to be recorded and the video surveillance system within the local research center was used and videos were kept securely on the computer within the recording room. Sessions within early intervention are run based on family preference and can include local areas that are not in-home, so this location still represents how sessions are conducted in early intervention.

Baseline

Baseline consisted of three data points to determine stability in responding for both caregivers. Data were collected on the same recording sheet but each caregiver, and their corresponding data, were graphed as separate data paths on the same graph to account for individual responses. Baseline for each caregiver data set were low to mid-level and were stable. Although the first baseline point for one caregiver was at 100%, this decreased and maintained to 33.3%. An additional fourth baseline data point should have been collected to better determine stability, however, due to time constraints, this was not possible.

Intervention

Intervention was planned to be comprised of two different teaching components. The first component included delivering the controlling prompt immediately to the caregivers to teach them the PECS steps for Phase 1. This was conducted for two sessions and was a total of eight trials. The next component was supposed to be comprised of delivering the controlling prompt after 2s if the caregivers did not respond or delivered the controlling prompt if they responded

incorrectly. This was planned to be conducted for the remaining of the research. However, the researcher was unable to move on to the 2s time delay due to time constraints. During the zero second time delay, data sets for both caregivers were high, and then reached 100%. During the intervention phase, the researcher directed the caregivers to use specific toys based on the preference assessment results. Although the researcher implemented the zero second time delay, one caregiver did not achieve 100% until after three trials. The step that was performed incorrectly required the caregiver to refrain from providing a verbal prompt. The caregiver repeatedly asked Carl "what do you want?" The researcher could only provide a reminder at the beginning of the trial to not provide a verbal prompt and an additional reminder during the feedback component for that trial. After three trials, this caregiver consistently refrained from providing verbal prompts for the remainder of the trials. Intervention data were, therefore, high level and stable. Data for both baseline and intervention are graphically displayed within Figure 1.

Probe Sessions

A probe session for independent picture exchange occurred prior to baseline and then every two weeks during intervention. The researcher conducted the probe session, which also tested generalization of the exchange to new people. Probe sessions were conducted after the preference assessment in order to ensure there was an establishing operation in place for manding. The child's baseline probe data point was at zero because Carl did not independently exchange a picture. During the second probe data point, Carl did not independently exchange a picture. However, as that session progressed, Carl independently exchanged a card. The researcher then probed the exchange again, and Carl successfully independently made the exchange. The researcher then probed for Phase 2, distance and persistence, and Carl

independently exchanged a picture icon. The researcher also probed the caregivers' Phase 2 performance. Although never specifically taught within the study, the caregivers both performed all the steps correctly with 100% independence. This data is graphically displayed within Figure 2.

Self-Monitoring Sheets

Comparisons across participants could not be determined regarding rate of acquisitions for both caregivers and child in regard to frequency of at home trials. However, Carl's caregivers completed the self-monitoring sheets and self-reported that it helped keep track of what items they tried that were successful or unsuccessful. A more comprehensive sheet could be developed to better collect data, with more space. Although the researcher requested the family to practice at least five times a day, this family self-reported that they practiced upwards of 30 times a day.

Social Validity

Social validity survey was given to family and family anecdotally reported that they liked the study. However, the survey was not returned to the researcher.

Discussion

The purpose of the study was to evaluate the effectiveness of using CTD to teach caregivers how to teach their young child with ASD to use PECS within the early intervention schedule. The study used an evidenced-based teaching strategy to promote teaching children functional communication. The study sought to solve a problem that has arisen in early intervention, since there is limited research on teaching PECS on a less intensive schedule, making sessions less frequent and for a shorter amount of time. A survey was given out at the end of the study to the caregivers who participated in order to assess for social validity.

While conducting the research, the child engaged in a variety of challenging behavior such as crying, at first. The behavior primarily occurred during baseline and at the beginning of the intervention phase. It usually occurred when hand over hand was used. The researcher hypothesized that challenging behavior occurred because Carl was trying to escape the hand over hand while also trying to access the preferred item. Typically, when Carl reaches for the item, he receives it. However, during intervention when Carl reached for an item, he was physically redirected to pick up and put down a picture icon. This change in his behavioral sequence was most likely the source of the challenging behavior since it was abrupt and new. As the intervention continued, the challenging behavior slowly decreased. However, there is no specific data to document this since this was an anecdotal observation made by both the researcher and the caregivers

Limitations

Only one family was involved with the research study which limits both internal and external validity. Comparisons could not be made across families and the results were also not replicated across families. Furthermore, as common within applied research, as well as early

intervention, there was a cancellation during the research. This affected the amount of researcher-directed training the family received which affects the effectiveness of the research design and training. Furthermore, maintenance was not assessed so if the caregivers continue to use the protocol, there is no data on whether they are doing so correctly. There were anecdotal reports from the family that Carl was improving with PECS, and the toleration of hand over hand. However, since the researcher was looking at complete independent trades, the probe data and graphs shows no progress was made by the child. Future research could take more detailed data during probe sessions that would more accurately track progress in order to monitor small increments of improvement.

Furthermore, the research only focuses on the acquisition of the procedure by the caregivers and does not consistently take data of the children diagnosed with ASD. Additional research should be conducted, not only to replicate findings, but to also expand on the data being collected. Future researchers should replicate the study but also consistently collect data on the emergence of the child's functional communication via PECS as opposed to only probing data periodically. Future researchers can take more in-depth continuous data regarding the child's PECS acquisition to determine what levels of prompting are needed for the exchange and whether or not the need for physical prompts is decreasing. Data could also be collected in regard to joint attention to determine if there were any unintentional gains as a side effect of the study.

Additional research could also look into different aspects of modeling for the caregivers. Modeling could not be chosen as a consistent prompt for all steps for this research study because it could not be used during an error correction procedure. Using a model prompt, which would involve interacting with the child, would disrupt the chained sequence of behavior between the

caregivers and the child. The researcher was also unable to model the entire sequence before the caregivers began because the researcher could not be both the communicative partner and the helper. However, video modeling could be used at the beginning of each trial via a prerecorded Youtube video which may be beneficial for families.

Contribution to Current Literature

This research makes limited contributions to the current literature due to time constraints. However, it does suggest that it is possible to teach caregivers how to teach PECS on an early intervention schedule. The caregivers were able to implement the protocol independently and with high procedural fidelity even though they only received training once a week for an hour. The child was then able to acquire PECS skills in order to develop functional communication. However, this research did not determine if caregiver skills maintained or if additional PECS phases could be taught to both caregivers and the child. There is a small contribution to the literature, but a significant amount of research would need to be conducted to replicate results and expand on them. Additional research should closely monitor the frequency of exchanges practiced at home to rate of skill acquisition of both the caregivers and the child. Since only one family participated, comparisons across families could not be made. This information would benefit the field by allowing Early Intervention providers to recommend to families the number of exchanges to practice that is minimal, feasible, but still effective.

Figure 1

PECS Phase 1 Graph

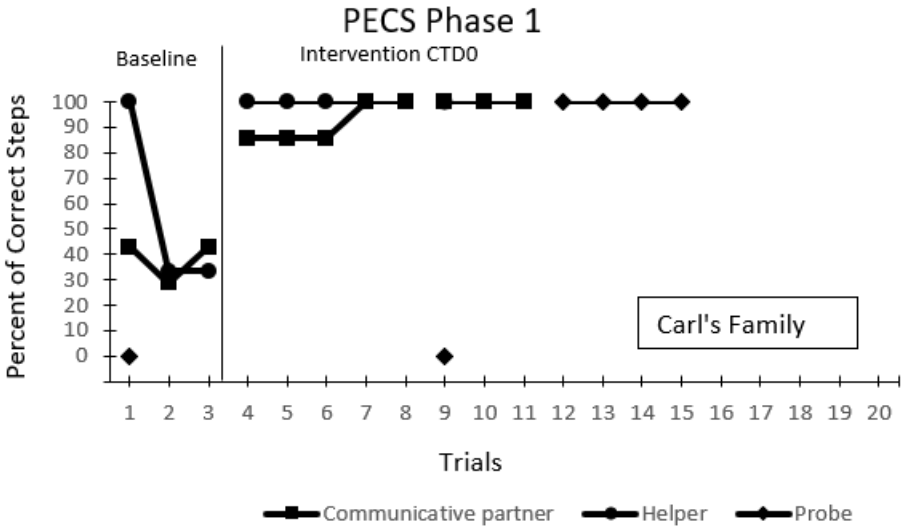
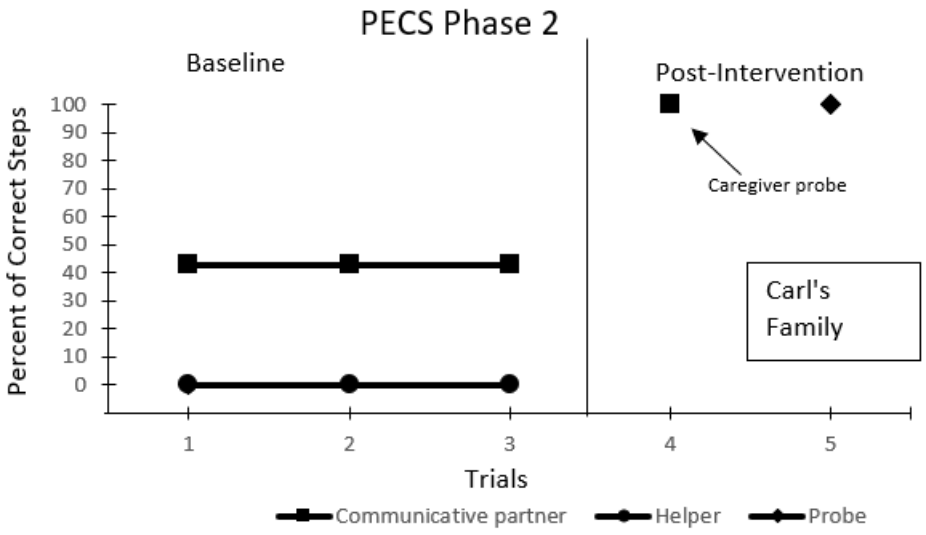


Figure 2

PECS Phase 2 Graph



Appendix A

Carl's VB-MAPP Results

Appendix B

PECS Phases 1-3a Data Sheets

Date:	
Staff:	
Step:	
IOA:	
1. Sit across from learner with reinforcer and picture icon in sight	
2. Communicative partner interacts with reinforcer	
3. Helper interrupts learner's reach and redirects to picture icon with physical prompt for reach	
4. Helper uses physical prompt to pick up picture icon	
5. Communicative partner opens hand AFTER learner picks up card	
6. Helper physically guides learner's hand to place picture icon in communicative partner's open palm	
7. Communicative partner immediately gives learner reinforcer	
8. Communicative partner names item	
9. Communicative partner returns picture icon to prior spot	
10. No verbal prompting used throughout	
Total Correct:	/
Total Percentage:	%

Date:	
Staff:	
Step:	
IOA:	
1. Sit across from learner with reinforcer and picture icon in sight	
2. Communicative partner interacts with reinforcer	
3. Helper interrupts learner's reach and redirects to picture icon with physical prompt for reach	
4. Helper uses physical prompt to pick up picture icon	
5. Communicative partner opens hand AFTER learner picks up card	
6. Helper provides no prompts for releasing icon	
7. Communicative partner immediately gives learner reinforcer	
8. Communicative partner names item	
9. Communicative partner returns picture icon to prior spot	
10. No verbal prompting used throughout	
Total Correct:	/
Total Percentage:	%

Date:	
Staff:	
Step:	
IOA:	
1. Sit across from learner with reinforcer and picture icon in sight	
2. Communicative partner interacts with reinforcer	
3. Helper interrupts learner's reach and redirects to picture icon with physical prompt for reach	
4. Helper uses no physical prompt to pick up icon	
5. Communicative partner opens hand AFTER learner picks up card	
6. Helper provides no prompts for releasing icon	
7. Communicative partner immediately gives learner reinforcer	
8. Communicative partner names item	
9. Communicative partner returns picture icon to prior spot	
10. No verbal prompting used throughout	
Total Correct:	/
Total Percentage:	%

Date:	
Staff:	
Step:	
IOA:	
1. Sit across from learner with reinforcer and picture icon in sight	
2. Communicative partner interacts with reinforcer	
3. Helper provides no prompts to reach or to pick up icon for learner	
4. Communicative partner opens hand AFTER learner picks up card	
5. Helper provides no prompts for releasing icon	
6. Communicative partner immediately gives learner reinforcer and names item	
7. Communicative partner returns picture icon to prior spot	
8. No verbal prompting used throughout	
Total Correct:	
Total Percentage:	

Date:	
Staff:	
Step:	
IOA:	
1. Sit across from learner with reinforcer and picture icon in sight	
2. Communicative partner interacts with reinforcer	
3. Helper provides no prompts to learner to pick up card	
4. Communicative partner moves at least 2 feet away from the learner	
5. Helper provides no prompts to learner to give card to communicative partner	
6. Communicative partner immediately gives learner reinforcer	
7. Communicative partner names item	
8. Communicative partner returns picture icon to prior spot	
9. No verbal prompting used throughout	
Total Correct:	/
Total Percentage:	%

Date:	
Staff:	
Step:	
IOA:	
1. Sit across from learner with reinforcer and picture icon in sight	
2. Communicative partner interacts with reinforcer	
3. Helper provides no prompts to learner to pick up card	
4. Communicative partner moves picture icon at least 2 feet away from the learner	
5. Helper provides no prompts to learner to give card to communicative partner	
6. Communicative partner immediately gives learner reinforcer	
7. Communicative partner names item	
8. Communicative partner returns picture icon to prior spot	
9. No verbal prompting used throughout	
Total Correct:	/
Total Percentage:	%

Date:	
Staff:	
Step:	
IOA:	
1. Sit across from learner with reinforcer and picture icon in sight	
2. Communicative partner interacts with reinforcer	
3. Helper provides no prompts to learner to pick up card	
4. Communicative partner moves picture icon at least 2 feet away from the learner and communicative partner moves 2 feet away from learner	
5. Helper provides no prompts to learner to give card to communicative partner	
6. Communicative partner immediately gives learner reinforcer	
7. Communicative partner names item	
8. Communicative partner returns picture icon to prior spot	
9. No verbal prompting used throughout	
Total Correct:	/
Total Percentage:	%

Date:	
Staff:	
Step:	
IOA:	
1. Provide two pictures at least two feet away from learner (one highly preferred, one non-preferred)	
2. Communicative partner interacts with two items	
3. Helper provides no prompts to learner to pick up card	
4. Communicative partner verbally praises learner when they touch the correct picture card (highly preferred picture)	
5. Helper provides no prompts to learner to give card to communicative partner	
6. Communicative partner immediately gives learner reinforcer	
7. Communicative partner names item	
8. Communicative partner returns picture icon to prior spot	
9. No verbal prompting used throughout	
Total Correct:	/
Total Percentage:	%

Appendix C

Self-Monitoring Sheets

Trial	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
1 Setting: Item:							
2 Setting: Item:							
3 Setting: Item:							
4 Setting: Item:							
5 Setting: Item:							

Challenges:

Successes:

Most commonly used reinforcers:

Appendix D

Social Validity

Questions	Score
1. How meaningful do you think it is to teach the picture exchange skill to children with speech delays as an alternative way for communication? 1 (Not at all) – 6 (Very much)	1 2 3 4 5 6
2. How important do you think it is for caregivers to teach their child with speech delays to use the PECS procedure at home? 1 (Not at all) – 6 (Very much)	1 2 3 4 5 6
3. How much do you think caregivers can successfully teach their child the PECS procedure when they have opportunities to learn how to train children to use it? 1 (Not at all) – 6 (Very much)	1 2 3 4 5 6
4. How feasible would it be for you to use the PECS procedure with your child at home? 1 (Not at all) – 6 (Very much)	1 2 3 4 5 6
5. How comfortable did you feel when teaching your child to use the PECS procedure? 1 (Not at all) – 6 (Very much)	1 2 3 4 5 6
6. My child learned picture exchange as a mean of communication during this study. 1 (Strongly disagree) – 6 (Strongly agree)	1 2 3 4 5 6
7. My child made meaningful progress as a result of participating in this study. 1 (Strongly disagree) – 6 (Strongly agree)	1 2 3 4 5 6
8. I would be likely to use the PECS procedure after this study. 1 (Strongly disagree) – 6 (Strongly agree)	1 2 3 4 5 6
9. I would recommend caregivers with children with speech delays to teach their child the PECS procedure. 1 (Strongly disagree) – 6 (Strongly agree)	1 2 3 4 5 6

Appendix E

Preference Assessments

MSWO for 7 items

Item A: _____
Item B: _____
Item C: _____
Item D: _____
Item E: _____
Item F: _____
Item G: _____

Sum of trial #s for A: _____
Sum of trial #s for B: _____
Sum of trial #s for C: _____
Sum of trial #s for D: _____
Sum of trial #s for E: _____
Sum of trial #s for F: _____
Sum of trial #s for G: _____

Date:		
Child name:		
Teacher name:		
Trial #	**Item selected**	**Placement of item selected**
1		x x x x x x x
2		x x x x x x
3		x x x x x
4		x x x x
5		x x x
6		x x
7		x

Date:		
Child name:		
Teacher name:		
Trial #	**Item selected**	**Placement of item selected**
1		x x x x x x x
2		x x x x x x
3		x x x x x
4		x x x x
5		x x x
6		x x
7		x

MSWO for 6 items

Item A: _____
Item B: _____
Item C: _____
Item D: _____
Item E: _____
Item F: _____

Sum of trial #s for A: _____
Sum of trial #s for B: _____
Sum of trial #s for C: _____
Sum of trial #s for D: _____
Sum of trial #s for E: _____
Sum of trial #s for F: _____

Date:		
Child name:		
Teacher name:		
Trial #	**Item selected**	**Placement of item selected**
1		x x x x x x
2		x x x x x
3		x x x x
4		x x x
5		x x
6		x

Date:		
Child name:		
Teacher name:		
Trial #	**Item selected**	**Placement of item selected**
1		x x x x x x
2		x x x x x
3		x x x x
4		x x x
5		x x
6		x

MSWO for 5 items

Item A: _____
Item B: _____
Item C: _____
Item D: _____
Item E: _____

Sum of trial #s for A: _____
Sum of trial #s for B: _____
Sum of trial #s for C: _____
Sum of trial #s for D: _____
Sum of trial #s for E: _____

Date:		
Child name:		
Teacher name:		
Trial #	**Item selected**	**Placement of item selected**
1		x x x x x
2		x x x x
3		x x x
4		x x
5		x

Date:		
Child name:		
Teacher name:		
Trial #	**Item selected**	**Placement of item selected**
1		x x x x x
2		x x x x
3		x x x
4		x x
5		x

Paired Stimulus Preference Assessment (4 items)

Item A: _____
Item B: _____
Item C: _____
Item D: _____

Item A selected: _____ times
Item B selected: _____ times
Item C selected: _____ times
Item D selected: _____ times

Date:	
Child:	
Teacher:	
Trial #	**Item selection**
1.	A B
2.	C A
3.	A D
4.	B C
5.	D B
6.	C D

Date:	
Child:	
Teacher:	
Trial #	**Item selection**
1.	A B
2.	C A
3.	A D
4.	B C
5.	D B
6.	C D

Free Operant Observation Log

Date:	Location:	Teacher:	Child:

Item/Activity	**Approached**	**Did not approach**	**Engaged with**	**Duration of engagement**
				_____ min, _____ s
				_____ min, _____ s
				_____ min, _____ s
				_____ min, _____ s
				_____ min, _____ s
				_____ min, _____ s
				_____ min, _____ s

Appendix F

Procedural Fidelity Chart

Conduct MSWO preference assessment prior to trials										
Request verbal confirmation to start trial										
CTD0	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9	Step 10
Immediately provide controlling prompt with 0 second delay interval										
Provide verbal praise, smile, or thumbs up after correct response										

Conduct MSWO preference assessment prior to trials										
Request verbal confirmation to start trial										
CTD2	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9	Step 10
Provide controlling prompt after 2 second delay interval										
Provide verbal praise, smile, or thumbs up after correct response										
Immediately provide controlling prompt if incorrect response occurs										

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