# THE EFFECTS OF BEHAVIORAL SKILLS TRAINING ON IMPLEMENTATION AND GENERALIZATION OF THE PICTURE EXCHANGE COMMUNICATION SYSTEM (PECS): A SYSTEMATIC REPLICATION

by

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## Abstract

The effectiveness of a behavioral skills training (BST) package, which included verbal and written instructions, modeling and role-play with a confederate learner, and feedback was used to teach the implementation of Phases 1 –3A of the picture exchange communication system (PECS). The BST package was implemented using a multiple baseline design across three instructional staff at a center that provides services to children with autism. All participants had minimal or no previous training in PECS. Results indicate the BST package was effective in teaching these skills to all participants in a minimal amount of time, and that the results of training generalized to the classroom environment with students to whom the teachers were assigned to work with on a daily basis. Results are discussed with respect to the effectiveness and efficiency of the training package; and implications for future trainings for individuals who work with children with limited functional communication skills.

## Table of Contents

# The Effects of Behavioral Skills Training on Implementation and Generalization of the Picture Exchange Communication System (PECS): A Systematic Replication

According to the most recent statistics from the Center for Disease Control (CDC, 2009), it is estimated that 1 in 110 children in the United States are diagnosed with an Autism Spectrum Disorder (ASD). Depending on the developmental level and chronological age of the individual, appearances of ASD may vary greatly, which is why autism is often referred to as a "spectrum disorder." ASDs have been reported across all racial, ethnic and socioeconomic groups, but are four to five times more likely to occur in boys than in girls. There are five disorders that are currently categorized as Pervasive Developmental Disorders (PDD): Autistic Disorder, Asperger Syndrome, Pervasive Developmental Disorder - Not Otherwise Specified (PDD-NOS), Rett's Disorder and Childhood Disintegrative Disorder (CDD; Diagnostic and Statistical Manual of Mental Disorders, 2000, Fourth Edition, Text Revision; DSM-IV-TR).

## Diagnosis Criteria and Spectrum Overview

Given that there are no medical tests to diagnose an ASD, individuals responsible for providing such diagnoses conduct direct observations and other assessment instruments to assist in providing a diagnosis (i.e., Autism Diagnostic Interview-Revised, Autism Diagnostic Observation Schedule, Childhood Autism Rating Scale). ASDs can be detected at 18 months or younger. By the age of two, a diagnosis by a professional can be considered very reliable. However, many children do not receive a final diagnosis until they are much older (DSM-IV-TR, 2000). Individuals with autistic disorder (also considered "classic" autism), usually have significant language delays, social and communication challenges, and unusual or restricted, repetitive, and stereotyped patterns of behaviors and interests (see

Table 1 for specific details and examples). Persons with autism may also have comorbid intellectual delays and disabilities. For example, in some cases of ASDs, an associated diagnosis of mild to moderate mental retardation, neurological condition such as Fragile X syndrome, or tuberous sclerosis may exist (DSM-IV-TR, 2000). ASDs also tend to occur more often in individuals who have other medical conditions (i.e., about 10% of children with an ASD have an identifiable genetic disorder). Some signs and symptoms of autism may begin to appear as early as the first few months of an infant's life, or as late as 24 months of age and sometimes later. Some children with an ASD seem to develop typically until around 18 to 24 months of age and then they stop gaining new skills, or lose the skills they once had. ASDs begin before the age of three and continue throughout the lifetime of the individual.

According to the DSM-IV-TR (2000), the essential features of Asperger's Disorder are severe and sustained impairments in social interaction and the development of restricted, repetitive patterns of behavior, interests, and activities. There are no clinically significant delays or deviance in language acquisition. Individuals that meet some of the criteria for autism or Asperger's syndrome, but not all, may be diagnosed with PDD-NOS. Individuals diagnosed with PDD-NOS usually have fewer and milder symptoms than those with autistic disorder. The symptoms might cause only social and communication challenges. The diagnosis of PDD-NOS is used when there is severe and pervasive impairment in development of reciprocal social interaction, associated with either verbal or nonverbal communication skills, or with the presence of stereotyped behavior, interests, and activities (DSM-IV-TR, 2000). Rett's Disorder and CDD are also classified as PDDs. The essential feature of Rett's Disorder is the development of multiple specific deficits following a period

of normal functioning after birth, and is only diagnosed in females. There is also a characteristic pattern of head growth deceleration, loss of previously acquired purposeful hand skills, and the appearance of poorly coordinated gait or trunk movements (DSM-IV-TR, 2000). The essential feature of CDD is a marked regression in multiple areas of functioning following a period of at least two years of apparently normal development. CDD differs from Autistic Disorder in that in Autistic Disorder, developmental abnormalities are usually noted within the first year of life (DSM-IV-TR, 2000).

**Causes, Risk Factors, and Treatment**

There is no known cause for ASD although some patterns have been detected in recent research. For example, there is now some agreement that autism may be partially linked to genetics (Wilderson, Volpe, Dean & Titus, 2002). Research to support this claim includes studies which demonstrate that an increased risk of autism exists among siblings of individuals with the disorder (i.e., approximately 5% of siblings also exhibit the characteristics; DSM-IV-TR, 2000). In addition, environmental influences, including some harmful drugs taken during pregnancy, have been linked with a higher risk of ASDs (i.e., prescription drugs thalidomide and valproic acid; Wilderson, Volpe, Dean & Titus, 2002).

A cure for ASDs does not currently exist. However, research has shown that early intervention treatment services can greatly improve a child's development (Rogers, 1996). Early intervention services are aimed at helping children from birth to three years of age to learn important life skills. Services in an early intervention program may include speech, physical, developmental, and behavioral therapies. Behavioral therapies may include helping the child interact with others using a form of functional communication. Applied Behavior

Analysis (ABA) has become widely accepted among healthcare professionals and used in many schools and treatment clinics (Simpson, 2001).

ABA teaches individuals to emit appropriate behaviors and aims to decrease inappropriate behaviors using behavioral principles. ABA includes such methods as discrete trial training, natural environment training, pivotal response training, and verbal behavior interventions, to name a few. To demonstrate the effectiveness of behavior therapy for children with autism, Lovaas, Koegel, Simmons, and Long (1973) treated 20 children diagnosed with autism who were severely disabled and low functioning using behavior therapy. In order to reduce problem behaviors such as interfering self-stimulatory, self-destructive and/or tantrum behavior; therapists used a combination of contingent reinforcement withdrawal, contingent aversive stimulation (slap or electric shock), and reinforcement of incompatible behavior. Once these contingencies had been introduced, a core training program based on reinforcement was introduced which focused mainly on language training and also on development of social and self-help skills. Upon completion of the therapy procedures, inappropriate behavior (such as self stimulation) decreased during treatment and appropriate behaviors (such as toy play) increased. For some children, spontaneous interaction occurred starting about eight months into the treatment. IQs and social quotients also increased. Follow up measures were taken at 1 and 4 years after completion of treatment. Results of follow up treatments demonstrated that those children whose parents were trained in and implemented behavior therapy were significantly more advanced than those who did not keep receiving behavior therapy treatment.

**Prevalence of Nonverbal Children**

As mentioned previously, children with ASDs may have a delay in verbal communication or may never develop vocal verbal communication. According to the CDC (2009), approximately 40% of children with an ASD have no vocal verbal behavior, or verbalize only a few words. Another 25 – 30% of children with autism acquire some words by 12 to 18 months of age, and then lose them. Others may speak, but not until later in childhood. The focus of functional communication is to teach a nonverbal child a way to communicate wants and needs in their environment. Because of the deficiencies that children with ASDs may face, it is important to address teaching these skills in the clinical setting.

**Functional Communication Systems**

Even with early intensive intervention including speech therapy, some children may never acquire functional communication. Training in an alternative or augmentative communication system is an option for children with autism who do not readily learn speech and may be useful as a transition to vocal verbal behavior in previously nonverbal children (Charlop-Christy, 2002). Augmentative and Alternative Communication (AAC) systems were developed as a means of functional communication for nonverbal persons. AAC systems include sign language, vocal output instruments and the Picture Exchange Communication System (PECS).

**Sign Language**. Sign language teaches children to imitate signs made by the educator. Children are then taught to mand (Skinner, 1957) or request preferred items, engage in conversation, and emit verbal behavior under the control of various stimulus

conditions. A benefit of teaching sign language to non-vocal children with an ASD is that sign language is an unaided system, meaning it does not require any external equipment.

Research conducted on sign language interventions and simultaneous sign and speech for children with autism has shown some positive findings (Seal & Bonvillian, 1997; Tincani, 2004). For example, Tincani (2004) implemented sign language training with two school-aged children with ASD. The simplest American Sign Language (ASL) sign that conveyed the meaning of each item was taught. Training began by teaching a sign for a specified preferred item. Sign language training involved two individuals: the experimenter served as the listener and the second individual delivered prompts while seated behind the participant. The experimenter presented an item, then signed the name of the item and simultaneously vocalized the name of the item. The experimenter used progressive time delay to gradually increase the time between presentation of the item and vocal modeling prompts until the child could perform the correct sign unprompted.

Some studies have shown negative findings for the use of sign language as a functional communication system (Ganz, 2004). Imitation may be one reason manual signs are difficult for individuals with ASD to use and understand. Specifically, children who do not readily imitate instructors may not be successful in acquiring or understanding signs to communicate. Children with ASDs may also have trouble developing their fine motor skills, which can also lead to difficulties learning manual signs (Ganz, 2004).

**Vocal Output Communication Aids.** Other AAC systems include electronic devices such as the voice output communication aids (VOCAs). VOCAs involve activation of a device to provide recorded or synthesized speech. Advantages of VOCAs relative to other AACs have been reported (Schepis & Reid, 1995). Compared to manual signing and

graphic-based systems, VOCAs permit the programming of messages of varying length and content that are easily understood by individuals who are both familiar and unfamiliar with the VOCA user (Schepis, Reid, Behrmann, & Sutton, 1998). As with other AAC systems, children have been observed to develop prompt dependency. Students are not taught to initiate a communicative act, rather they are taught to respond to a question (e.g. "What do you want?" "What do you see?"). If prompts are not quickly and efficiently fade, the students may not generalize their training to spontaneous communication (Bondy, 2001).

**Picture Systems.** Finally, pictures may be used as a form of functional communication in children with ASD. Children may be taught to point to or touch pictures that correspond to objects or events they desire. Picture based communication systems, which typically provide two-dimensional representations may be easier for some children with ASD to learn than manual sign symbols (Ganz, 2004). In addition, the picture point system used as a form of functional communication has benefits over systems such as sign language for those students who have motor problems. However, Bondy (2001), observed that while some children with autism learned appropriate picture-point skills, many did not show significant progress. These observations suggest that some young children have difficulty neatly pointing to single pictures. Also, in a picture point system, children are being taught to respond to pictures and not to a communicative partner. That is, their behavior is not under stimulus control of a communicative partner.

When AAC systems such as sign language and picture point systems are taught to children, a common problem is prompt dependency. Many communication training programs begin with teaching imitation and/or responding to questions. A potential problem with these types of strategies is that if the questions are not rapidly and carefully removed,

some children are reported to become prompt dependent, meaning they will not generalize their training to independently initiate a request or communicative act (Bondy, 2001).

**Picture Exchange Communication System.** The Picture Exchange Communication System (PECS) has gained widespread use nationally and internationally with children with autism and is appealing for several reasons. First, the system does not require complex motor movements, such as sign language, on part of the speaker (student) and does not require the listener (parent, teacher, peer, etc.) to be familiar with an additional language. Second, the PECS system has a relatively low cost and is portable and suitable for use in many settings. Third, previous research has indicated that the system can be taught relatively rapidly (Bondy & Frost, 1993). Lastly, PECS incorporates functional communicative responses that promote meaningful interactions between the child and the environment (Frost & Bondy, 2002).

Bondy and Frost (1994) developed PECS based on Skinner's 1957 description of verbal operants and a behavior analytic perspective regarding autism. PECS was developed as a communication system that could be taught very rapidly to children with autism who lacked functional communication. The system uses basic behavioral principles and techniques including shaping, differential reinforcement, and transfer of stimulus control via prompt delay to teach children functional communication using pictures (Bondy & Frost, 2003). The sequence of the PECS protocol (See Table 2 for description of phases 1-6 of PECS) was carefully determined based on concerns discovered in research on other AAC methods including high probability of prompt dependency, problems with requiring an imitative repertoire as a prerequisite condition, and the absence of the acquisition of functional communication skills (Bondy, 2001). Children with autism often display few

social approaches to adults and have limited repertoires for extending interactions initiated by others. Attempts to teach children with ASD functional communication skills must address their current repertoires and deficits as well as the types of consequences that may be effective in educational arrangements.

The PECS system is unique among alternative communication systems in that it requires the child to approach a listener and initiate interaction prior to emitting a communicative act (Bondy & Frost, 2001). Traditional speech training usually begins by teaching students to respond to verbal prompts, whereas PECS instruction begins by teaching the student a social approach to another individual (Ganz & Simpson, 2004). Many communication techniques begin by teaching children to label items. Bondy and Frost (2001) explain that requesting should be taught to children with ASD first, because it is rewarded and maintained by concrete reinforcement (i.e., access to the item requested). Other systems use social reinforcement first, which is not motivating for many individuals with ASD.

***Previous Research on the Use of PECS.*** Several studies have looked at different aspects of acquisition of PECS in children with ASD. Studies have evaluated the effects of PECS to decrease problem behavior such as tantrums, out-of-seat behavior, and other disruptive behavior (Carr, & Durand, 1985; Charlop-Christy, Le, LeBlanc, & Kellet, 2002; Durand & Carr,1991; Durand & Merges, 2001); increase vocalizations (Charlop-Christy et. al., 2002; Ganz, & Simpson, 2004); generalization of PECS to the natural environment (Schwartz, Garfinkle, Bauer, 1998); and the overall effectiveness and efficiency of implementing the system.

For example, Schwartz, Garfinkle, and Bauer (1998) evaluated the effectiveness and efficiency of the system for children with developmental disabilities. This study also evaluated the generalization of PECS to settings in which the system had not been directly trained (i.e., snack and free time). Markel, Neef, and Ferraris (2006) also evaluated the generalization skills of children when using PECS. Specifically, these experimenters trained the use of descriptors (functions, colors, shapes) for preferred items or activities, and evaluated whether children would learn to request and improvise new, untrained requests using a limited number of picture symbols. Results demonstrated a number of improvised requests and skill generalization to novel items, settings, and listeners increased upon completion of training. A final study which evaluated generalization effects of PECS was conducted by Rosales and Rehfeldt (2007), in which adults with mental retardation were directly trained to exchange pictures of needed items (i.e., headphones) to complete a chained task (i.e., playing a CD on a portable walkman), and subsequently tested on the exchange of a written word which corresponded to the picture to request the same item. Results suggested that a history of reinforced conditional discriminations led to the emergence of mands using text.

Although the majority of empirical support for implementation of PECS is with children, there are some studies which have evaluated the effectiveness of PECS for adults (Rosales & Rehfeldt, 2007). Most recently, Conklin and Mayer (2010) evaluated the effects of PECS training with a multiple baseline across independent initiations of three adults with developmental disabilities and severe communication deficits. Results indicated a functional relationship between teaching of PECS and the increases of independent initiations. These initiations also continued to improve after initial training.

Sulzer-Azaroff, Hoffman, Horton, Bondy and Frost (2009) compiled and analyzed the results of 34 peer-reviewed published reports on PECS. The data revealed that PECS has become an increasingly popular, easily implemented, means for teaching an alternative form of communication to individuals around the world who lack functional speech. Results also indicated that intensive PECS training generalizes and maintains across settings and communicative partners, and helps to establish a strong functional communicative repertoire (Bondy & Frost, 1994; Howlin, Gordon, Pasco, Wade & Charman, 2007). Finally, analyses of the studies strongly support the conclusion that the PECS protocol helps to establish successful initiations and functional communication when parents and professionals implement this system.

For example, Howlin, Gordon, Pasco, Wade, and Charman (2007) assessed the effectiveness of expert training and consulting for teachers of children with autism in the use of PECS. This study consisted of three groups: immediate treatment, delayed treatment, and a no treatment control. 84 elementary school children were randomly assigned to one of the three groups. Before the active treatment phase began, teachers attended a two day PECS workshop by Frost and Bondy. The active treatment period began approximately one week after completion of the workshops and consisted of an additional six school-based training sessions with expert consultants in which modeling and demonstrations were conducted for advanced learners using PECS. These training sessions occurred over a five-month period following the initial workshops. Consultants also monitored teachers' progress and provided feedback. Following each visit, class teachers were provided with written summaries, agreed action points, and future goals. Outcome measures of this study evaluated rates of communicative initiations, use of PECS, and speech in the classroom. The results

demonstrated modest effectiveness of teacher training in PECS. Rates of initiations and PECS usage increased significantly ($p < .001$) immediately post-treatment. No effects were found on improvements in verbal speech. In addition, treatment effects were not maintained once active intervention ceased. Limitations of this study included the inclusion of only one measurement point at each assessment period for each child. This does not allow findings of a stable or variable trend in data to be identified. Also, the period of observation (i.e., snack time) may not reflect children's changes in communication, since this is a time period of high motivation. Evaluating generalization to other environments could allow investigators to assess the true value of training.

Despite the amount of empirical support for the effectiveness of PECS as a functional communication system, few studies have empirically evaluated a specific *training protocol* for proper implementation of PECS. For the majority of studies that have evaluated training the implementation of PECS (the exception being the study summarized above), a behavioral staff training (BST) package has been implemented. BST packages typically consist of a combination of instructions, modeling, rehearsal, praise and corrective feedback. The use of BST packages has been shown effective across a variety of situations and training environments including teaching sexual abuse prevention skills to adults with mental retardation (Lumley, Miltenberger, Long, Rapp & Roberts, 1998); training teachers to correctly implement discrete trial teaching (Sarokoff & Sturmey, 2004); teaching children abduction-prevention skills (Johnson et al., 2006); using peers as tutors to teach appropriate safety behaviors around firearms (Jostad, Miltenberger, Kelso, & Knudson, 2008); and increasing correct implementation of guided compliance by caregivers of children who exhibited noncompliance (Miles & Wilder, 2009).

Chaabane, Alber-Morgan, and DeBar (2009) examined the effectiveness of teaching mothers to train their children to exchange novel pictures (descriptors such as color, shape and function) to request items using PECS. Both children were already fluent in the first phase of PECS and could mand for desired items. Trainers taught the mothers how to implement the training using written instructions, explanation, modeling, practice and feedback. After mothers implemented training with the children, generalization probes assessed each child's mands for untrained items. Child responses were scored as an error, non-response, or improvisation. Results showed a clear functional relation between parent-implemented training and improvisation of mands, indicating it is possible for parents to successfully aid in the training of PECS their children. A limitation of this study was not implementing a maintenance phase. The use of a maintenance phase would have provided support for long-term outcomes of parent-implemented training interventions.

Wood, Luiselli, and Harchik (2007) examined a training program with four direct-care staff providers at a community-based habilitation setting. During training sessions, participants worked with a 24-year old male (the leaner), with a diagnosis of autism and mental retardation. The staff employees were trained to implement Phase 1 of PECS with the learner. Following baseline observations, the trainer (experimenter) met with each participant, at which time she presented the rationale for PECS and a detailed review of Phase 1 procedures. The trainer modeled correct performance of the 13-step instructional sequence described for Phase 1. The participant then rehearsed the steps and received performance feedback. Finally, the trainer observed the participants implementing PECS with the learner. Participants were provided with immediate feedback regarding their performance, and the trainer shared the percentage accuracy of implementation with each

participant approximately every two sessions. Results demonstrated effective paraprofessional staff training within the natural environment, and maintenance of performance over multiple observation sessions. Limitations of this study included lack of evaluation of the participants' performance following the instruction and education portion of the training and the fact that only Phase 1 of PECS was taught to the participants. In addition, assessing whether or not this training would generalize to other residents and environments at the facility would be beneficial.

Finally, Rosales, Stone, and Rehfeldt (2009) evaluated the effectiveness of a behavioral skills training (BST) package on the implementation of PECS. The training package consisted of viewing a video on the implementation of PECS, written and verbal instructions, modeling by the experimenter, rehearsal by the participant with a confederate, and verbal feedback provided by the experimenter on correct and incorrect responses. Participants included two undergraduate and one graduate student with no prior training in the implementation of any functional communication system. An advanced undergraduate student skilled in PECS implementation served as the confederate learner during all training sessions. The primary dependent variable was the percentage of correctly performed responses on a checklist, which was developed by the authors and based off of the Bondy and Frost (2002) PECS training manual. Generalization and maintenance probes were also conducted with an adult diagnosed with moderate to severe mental retardation. All participants met criterion for the first three phases of PECS during post-training probes, generalization, and follow-up. Limitations of this study include use of a confederate learner during all training sessions and lack of evaluation in a naturalistic setting. For example, an examination of the implementation of PECS in a classroom setting, with uncontrollable

distractions may present participants with additional variables that may influence their performance in implementation.

The purpose of the present study was to systematically replicate and extend the previous research on the implementation of PECS. A BST package, which included verbal and written instructions, modeling and rehearsal with a confederate learner, and feedback, was employed to train teachers working with children with autism to implement the first three phases of PECS. The package included one less component than that used by Rosales and colleagues. Instructional staff participants were trained with a confederate learner. The present study also evaluated generalization of implementation to the natural school environment. Specifically, data was collected on teachers' use of PECS during discrete trial training time with multiple students from the classroom. By evaluating generalization, determinations about the ability of the BST package to train lasting behaviors could be determined.

## Method

**Participants**. Three instructional staff were recruited as participants for this study. Staff members worked in either a preschool classroom or school-age classroom. All participants had a Bachelor's degree and were employed at a center located on the grounds of a university in Northeast Ohio. Participant 1 one taught in a preschool aged classroom, held a bachelor's degree in English, and had worked at the center for 8 months at the start of this study. Participant 2 taught in a school aged classroom, held a bachelor's degree in Psychology and had worked at the center for 18 months at the start of the study. Participant 3 taught in a preschool aged classroom, held a bachelor's degree in Community Health, and had worked at the center for 6 months at the start of the study. All participants had a minimum (Participant 2) or no experience (Participants 1 and 3) implementing PECS with students in their classroom or at the center. Specifically, all participants had received a brief, one day training in PECS by a speech pathologist employed at the center. This training consisted of a didactic presentation on the implementation of PECS, various environments in which PECS can be implemented, modeling between the speech therapist and another instructor, and role-play between instructors. The training was conducted for Phase 1 of PECS *only* and no feedback was provided to instructional staff after the training.

Two individuals were recruited as *confederate learners* for the duration of the training phase, and nine students with a diagnosis of autism were recruited for the of the generalization phase. The confederate learners were previously trained and/or highly fluent in the use and implementation of PECS. The confederate learner that was not already fluent in the implementation of PECS received training which consisted of brief modeling and a written list of potential responses a student may emit for each phase of PECS to be trained.

The confederates were instructed to emit each response on the list at least one time during each five-trial block (see Appendix H-J). Students recruited to serve as participants ranged in age from 2-7 years old, had limited or nonexistent vocal verbal communication, and minimum or no previous experience with PECS. For example, students may have had some exposure exchanging pictures during snack and play time. However, no student participants had previous exposure to training using the PECS protocol. Each instructional staff participant was assigned one or two students for the duration of the generalization phase of the study.

**Settings and Materials.** Baseline and training sessions were conducted in an isolated room at the center used for assessment purposes. This room was 10 ft by 10 ft, with two doors and a one-way mirror. There were three tables, several chairs, and a desktop computer. In addition, shelves were located high on the wall to keep items out of reach of students. Generalization sessions were conducted in the classroom, specifically in the discrete trial training areas. Discrete trial training areas were designated areas in the classroom. Work stations were separated by portable dividing walls so instructional staff and two students could work at the same time. Shelves were located high on the wall to store items for trial sessions. All sessions during baseline, training, and generalization phases were video recorded to assess interobserver agreement (IOA) using a Digital Flip video camera or a Kodak Easy Share camera.

Materials provided to teacher participants at the onset of training included a handout containing information on the first three phases of PECS as described by Frost and Bondy (2002). Materials for training sessions consisted of "preferred items" for confederate learners (these items consisted of random toys which were identified to the instructional staff

as preferred items for the confederate learners), data sheets created for the purpose of this study (see Appendix A-C), binders and pictures of preferred and neutral items. Binders were standard size and had an extra area to place a sentence strip during PECS use, when appropriate. Velcro strips were located on the binder so pictures could be easily removed. All pictures were 2 in. by 2 in. digital photographs taken for the purpose of this project. Materials for the generalization sessions included all the same items with the exception of initial information on the PECS phases and the addition of preferred and neutral items for students (determined via preference assessments, as discussed below). Sessions were held two to three times per week, for approximately 20-30 minutes. Generalization sessions were held two to three times per week during the classrooms' scheduled work time and last approximately 15 - 20 minutes.

**Experimental Design**. A multiple baseline across participants was employed to evaluate the effectiveness of the BST package. Baseline was implemented simultaneously across instructional staff participants. After the first participant obtained a stable trend in data during the baseline condition, Phase 1 of the BST package, which included training with a confederate, was implemented. Once the first participant met mastery criterion with the confederate learner, the first phase of the BST package (training with a confederate) was implemented with the second and third participants. At least one day separated the implementation of Phase 1 of the BST package between participants. After data supported a high level of proper implementation of PECS with the first participant, by demonstrating mastery criteria (90% correct for 3 consecutive trial blocks), generalization was assessed for all phases.

Throughout the generalization phase, data was collected to assess whether or not participants' responses maintained at criterion level. If instructional staff failed to meet criterion level for two consecutive sessions, they would receive modeling, role play, and feedback portion of the BST package with a confederate learner until criterion was again attained.

In order to minimize extraneous variables such as participants discussing portions of their training and/or feedback received, training was conducted in an area not visible to other participants. In addition, participants were asked to refrain from discussing any aspects of their training with other staff members at the center or in their classroom.

**Dependent Measure and Interobserver Agreement**. The primary dependent variable was the percentage of correctly performed responses on a checklist, based on the PECS training manual (Frost & Bondy, 2002), and similar to those employed by Rosales et. al. (2009). Checklists described each potential response for instructional staff participants during training and generalization phases (See Appendix A-C). Percentage of correctly performed steps on each checklist were calculated by summing the total number of correctly performed steps and dividing this number by the total possible responses in each five-trial block session. Some steps on the checklist were not always applicable to every response. These steps were marked as "N/A" and not used in the calculation of responses (e.g., providing a gestural prompt was not necessary if the learner reached for a picture card within 1-2s).

A correct response was defined as the instructional staff participant exhibiting a behavior exactly as described on the checklist, or not exhibiting a behavior if the step involved omission of a response. Certain steps on the checklist did not have to be performed

in the exact order listed, with the exception of those steps that required the completion of a previous step in order to be executed (i.e., waiting for 1 or 2s for the confederate/student learner to respond before administering a prompt). If the instructional staff implemented a step with any deviations from the description on the checklist or exhibited a prohibited behavior, the observers scored the step as incorrect. A trial was defined as the completion of all possible steps of the procedure within a phase.

Interobserver agreement was collected for at least 40% of all baseline, training, and generalization sessions. For Participant 1, IOA was collected for 41% of sessions (ranging from 82% to 100%, an average of 94%); for Participant 2, IOA was collected for 42% of sessions (ranging from 77% to 100%, an average of 93%); and for Participant 3, IOA was collected 44% of sessions (ranging from 88% to 99%, an average of 95%). IOA data was collected using videotaped recordings or in vivo recording depending on the availability of a second observer. Two observers trained in proper scoring of the videos collected IOA data. Observers were trained by receiving verbal explanation of each step on the checklists, definitions of what constituted a correct and incorrect or N/A response, and practiced scoring videos from a pilot participant until 80% agreement was reached with the primary observer. IOA was calculated by adding the number of agreements (observers agreeing that the step was performed correctly) plus disagreements (one observer scored step as correct, the other observer scored step as incorrect) and converting this ratio to a percentage (multiply by 100).

A second observer also collected data on treatment integrity via in vivo observation. A checklist of appropriate trainer responses was used, and the percentage of correct responses was scored (See Appendix D-F). Percentage of correct responses was determined by summing the total number of correctly performed steps and dividing this number by the

total possible responses. Some steps on the checklist were not always applicable to every response (i.e., giving corrective praise if all steps were performed properly) and were marked as "N/A" and not used in the calculation of responses. Treatment integrity was collected for 32% of sessions for Participant 1 (100% for all sessions), 34% of all sessions for Participant 2 (ranging from 83% - 100%, an average of 98%), and 33% of all sessions for Participant 3 (100% for all sessions).

**Procedure**

**Stimulus Preference Assessment**. Prior to the onset of baseline sessions, a paired choice preference assessment (Fisher et. al., 1992) was conducted for all student participants serving as learners during generalization probes. These assessments were conducted to ensure that the items being used throughout the duration of the generalization phase of the study were items the student preferred. Parents and/or teachers were asked to identify preferred items by completing the *Reinforcer Assessment for Individuals with Severe Disabilities (RAISD;* Fisher et. al., 1996*)*. *RAISD* is an interview protocol that asks caregivers to identify preferred stimuli across visual, auditor, olfactory, edible, tactile, and social domains. The paired choice preference assessment consisted of simultaneously presenting two stimuli at a time for each trial. The observer then recorded which stimuli the learner chose. During the course of the assessment, each stimulus was matched randomly with all other stimuli in the set. Each pairing of stimuli was presented twice. During the second presentation of any given pair of stimuli, the observer switched the sides that the stimuli were presented on in order to prevent position bias by the learner. Data collected indicated how many times each stimulus was chosen. The stimuli were then rank-ordered in terms of high,

medium, or low preference. For generalization purposes, only medium and highly preferred items were used.

**Baseline**. Prior to the onset of baseline, instructional staff participants were given handouts, based on Frost and Bondy's (2002) PECS training manual. Information was specific to the first three phases of PECS. Phase 1 of PECS consists of teaching the physical exchange of a picture card. The leaner is taught to hand over a card to a communicative partner (i.e., parent, teacher, peer, etc). Phase 2 includes teaching the expansion of spontaneity. The learner is taught to go to his/her PECS binder, get a picture card, seek out a communicative partner, and place the card in his or her hand to receive a reinforcer. The distance between the learner, the binder, and the communicative partner gradually increases and the response is trained in new settings. The third phase of PECS teaches picture discrimination. The learner is taught to discriminate among multiple pictures of preferred items on the PECS binder.

Instructional staff participants were instructed to read through the material provided and were free to refer back to the handouts throughout the duration of the study, but were not specifically instructed to do so. They were then provided with the necessary materials to conduct each of the first three phases of PECS and instructed to conduct one five-trial block of each phase with one of the confederate learners. No feedback was provided to at this time.

**BST**. Prior to training in each phase, the instructional staff participants were provided the appropriate checklists (see Appendix A-C), and the trainer (experimenter) verbally described each step. Participants were given a copy of the checklists, although no instruction to study the list was provided. After verbally describing the checklist, the trainer modeled each phase in a five-trial block with the confederate learner. Participants were then

instructed to rehearse each phase with the confederate learner in one 5-trial block. Prior to onset of each trial block, the participant was instructed to perform the steps as they were listed on the checklists provided. They were asked not to talk to or ask questions of the observer (experimenter) while completing the trial block. Rather, they were instructed to ask questions prior to or upon completion of each trial block. Feedback was then provided based on the participants' performance. If a step was implemented properly, specific positive feedback was provided (e.g. "You did a great job increasing distance between yourself and the student."). If a step was not implemented or implemented incorrectly, specific corrective feedback was provided (e.g. "Wait to extend your hand to receive the picture card until after the student initiates an exchange"). If no corrective feedback was required, only positive feedback was provided. Modeling, rehearsal, and feedback continued until the mastery criterion was attained (i.e., 90% correct responses across three consecutive trial blocks. Once the participants displayed mastery criterion in Phase 1 of PECS with the confederate learner, Phase 2 was taught using the BST package, then Phase 3 of PECS was taught in the same manner.

**Generalization.** Once participants met criterion during the BST phase, data was collected on generalization. During generalization probes, participants implemented PECS with student learners for which parental consent had been received, and that the instructional staff participants were assigned to work within their regular classrooms. Generalization sessions took place during the scheduled discrete trial teaching period. Scoring for generalization sessions was identical to baseline and BST sessions using the appropriate checklist for the phase the participant was currently working on with their student. If the instructional staff participants scored below criterion level for two consecutive trial blocks,

they would be trained using the rehearsal and feedback portions of the BST with a confederate learner until mastery level was obtained. However, this was not required for any of the participants.

**Social Validity**. Social validity measures were used to assess the practical/applicable use of the trained procedure. Social validity questionnaires were distributed to participants upon completion of the study and were completed anonymously. Instructional staff participants were asked to complete the survey to determine their opinion on the ease of implementation of the PECS protocol and feasibility for incorporation into the classroom routine (See Appendix G). All participants scored their understanding of the procedure and of PECS as clear or very clear. Participants also stated they would be willing, or very willing, to implement the trained procedure in their classrooms (See Table 4).

## Results

Figure 1 shows the percentage of correct responses for each phase of PECS during baseline, behavioral skills training, and generalization conducted in five-trial blocks. Throughout baseline, none of the instructional staff participants demonstrated criterion performance for any of the three training phases. Upon the implementation of behavioral skills training, all participants showed significant improvements relative to baseline. Mastery criterion (90% across two consecutive trial blocks) was demonstrated by all participants after no more than 4 five-trial blocks for each phase. For Phase 2, additional training sessions were conducted for all participants after mastery criterion was demonstrated. This was done to provide them with an opportunity to practice all responses for this phase at least once.

During baseline, Participant 1 demonstrated an average of 56% correct responding for Phase 1, 57% for Phase 2, and 53% for Phase 3. During the behavioral skills training phase this participant's scores increased to an average of 94% correct responding for Phase 1, 97% correct responding for Phase 2, and 90% correct responding for Phase 3. Only one 5-trial block was required before mastery criterion was met for Phase 1. During training for Phase 2, this participant immediately started responding above 90% correct. However, additional training sessions were provided in order to provide the participant with an opportunity to practice all steps of this phase. During Phase 3, three 5-trial blocks were required before responding reached 90% or above. During generalization probes, Participant 1 demonstrated an average of 99% correct responding for Phase 1, 100% correct responding for Phase 2 and 97% correct responding for Phase 3.

During baseline, Participant 2 demonstrated an average of 53% correct responding for Phase 1, 65% for Phase 2, and 50% for Phase 3. During the behavioral skills training phase, this participant demonstrated an average of 96% correct responding for Phase 1, 98% correct responding for Phase 2, and 98% correct responding for Phase 3. For all three phases, responding at or above criterion was demonstrated immediately upon implementation of the training package. During generalization probes, this participant demonstrated an average of 97% correct responding for Phase 1, 99% for Phase 2, and 95% for Phase 3.

During baseline, Participant 3 demonstrated an average of 56% correct responding for Phase 1, 65% for Phase 2, and 42% for Phase 3. After behavioral skills training was implemented, this participant's responses averaged 97% correct for Phase 1, 98% for Phase 2, and 93% for Phase 3. During the BST phase, Participant 3 demonstrated responding at or above criterion immediately for Phases 1 and 2. For Phase 3, only one 5-trial block was required before responding at criterion was demonstrated. During generalization probes, this participant demonstrated an average of 98% correct responding for Phase 1, 99% for Phase 2, and 97% for Phase 3.

Total training times for Participant 1 were 16m 15s for Phase 1, 33m 18s for Phase 2, and 34m and 1s for Phase 3; with a total training time of 83m 34s. For Participant 2, training time for Phase 1 was 6m 27s, 16m 2 s for Phase 2, and 7m 9s for Phase 3; with a total training time of 29m 38s. For Participant 3, training time for Phase 1 was 11m 22s; 15m 8s for Phase 2, and 28m 41 s for Phase 3; with a total time of 55m 11s. Different phases were associated with different trials to criterion, but progress was generally more rapid for phases 1 and 2.

## Discussion

In the present study, a multiple baseline across three instructional staff members illustrated the effectiveness of a BST package on the implementation and generalization of Phases 1-3A of PECS. This study provides additional evidence to support the use of BST packages for training staff to implement behavior analytic procedures (Lumley et. al., 1998, Johnson et al., 2006, Jostad et. al., 2008; Sarokoff & Sturmey, 2004). In addition, this study provides evidence for the generalization of skills to the natural (e.g., classroom) environment, and with a student learner with a diagnosis of autism. All three instructional staff participants mastered PECS implementation within a relatively short period of time, demonstrating the efficiency of the BST package.

These results replicate and extend those found by Rosales and colleagues (2009) and Wood and colleagues (2007). The current study used one less component than Rosales et. al. (i.e., omission of the training video), which allows an even shorter amount of training time. In addition, the present study set a higher criterion level for mastery (e.g. 90% versus 80%). Setting a higher criterion for mastery allows experimenters to make the determination that participants are utilizing the procedures in an appropriate manner by making sure critical steps are not consistently missed throughout any phase of the training. A common error made by all three instructional staff participants was not using an open hand to accept the picture card from the confederate and/or student learner. This error occurred across all phases. A common error emitted in Phase 3, was missing steps in the four step error correction procedure. This may have also accounted for the additional training session required across all participants for Phase 3.

In addition, the present investigation assessed generalization with student learners that were already assigned to the instructional staff participants, and skills were assessed in the staff's natural teaching environment (i.e., their individual classroom). Results from both training and generalization probes indicate that whether or not instructional staff participants have little or extensive experience working with children with autism, Phases 1-3A of the PECS protocol are effectively and efficiently learned with the implementation of a BST package.

Finally, the implementation skills that instructional staff participants acquired during the present study are very relevant to their current teaching positions. All instructional staff participants work in classrooms with nonverbal children, therefore the utilization of the procedures learned may be extremely beneficial when implemented in the classroom. During generalization probes, student learners showed improvements throughout the three 5-trial blocks administered for each of the three phases of PECS. While one student (used for generalization probes of Phase 1 for Participant 1), never responded independently, the level of prompts decreased (e.g. full physical prompts reduced to only requiring an open hand prompt for student to respond). Participants in previous studies (Rosales et. al., 2009) were undergraduate students who may or may not use the skills they acquired at some point in the future. Therefore, the use of instructional staff in the present study was an expansion upon previous research. Wood et. al., (2007) trained four direct care staff providers to teach adult learners with developmental disabilities. Both of these studies looked at generalization with adult learners. The present study expanded these results by looking at generalization with children on the autism spectrum.

Results of the present study may also imply that parents of children with autism can learn the PECS protocol. Future research would benefit by investigating the use of a BST package with PECS implementation with parents, siblings, and/or peers. People who are close to the nonverbal child, and/or come into contact with them frequently would benefit from learning how to implement the PECS protocol properly. Wood and colleagues (2007) examined a training program with four direct-care staff providers at a community-based habilitation setting. During training sessions, participants worked with a 24-year old male (the leaner) with a diagnosis of autism and mental retardation. Results demonstrated effective paraprofessional staff training within the natural environment and maintenance of performance over multiple observation sessions. Results of the present study extend these findings by providing evidence for training with a confederate learner as opposed to training with a student diagnosed with autism. This may be beneficial for future trainings by allowing them to be completed in a quicker time period before the teacher, parent, or peer begins implementation with a nonverbal child.

Chaabane, Alber-Morgan, and DeBar (2009) examined the effectiveness of teaching mothers to train their children to exchange novel pictures (i.e., descriptors such as color, shape and function) to request items using PECS. The training consisted of written instructions, explanation, modeling, practice and feedback. After mothers implemented training with the children, generalization probes assessed each child's requests for untrained items. Results showed a clear functional relation between parent-implemented training and improvisation of mands, indicating it is possible for parents to successfully aid in the training of PECS to their children. The present study supports these findings by providing additional evidence of a functional relationship between the use of a training package and the ability to

implement PECS properly with students. In the future, researchers may benefit from looking at the differences between training experiences of the communicative partner and how it relates to student acquisition. Acquisition generally took longer (e.g. additional trials and extended length of trials) for Phase 3, with the exception of Participant 2. Participant 2 had the most extensive experience in working with children with autism, which may be a factor the quicker acquisition time. This may provide additional evidence for the strength and efficiency of the BST package to train PECS implementation.

Results of the social validity questionnaires show support for the functionality of PECS with students. Sulzer-Azaroff, Hoffman, Horton, Bondy and Frost (2009), analyzed 34 peer-reviewed published reports on PECS. Results of this analysis indicated that intensive PECS training with nonverbal children generalizes and maintains across settings and communicative partners. Analyses of the studies strongly support the conclusion that the PECS protocol helps to establish successful initiations and functional communication when parents and professionals implement this system. Results of the social validity questionnaire used in the present study demonstrated that instructional staff participants thought the trained procedures were very important for the population they work with (see Table 3).

Upon completion of the study, anecdotal information was obtained about the instructional staff's use of PECS in their classroom routines. Participants 1 and 3 are currently using pictures during their snack time, playtime and music time activities, requiring students to request desired edible or tangible items. Participant 2 added a PECS work time to their daily classroom schedule where students are being taught to exchange pictures as a group and individually.

Future trainings in settings similar to where the present study was conducted may benefit from using specific components of the BST package (e.g. feedback and modeling). The use of feedback is beneficial because it allows staff members to receive specific information on what they are doing incorrectly and/or correctly. Without feedback, they may continue to incorrectly implement procedures. Feinberg, Dunn, and Pace (2005) investigated the use of feedback to increasing special education teachers' treatment integrity for implementing antecedent and consequence procedures in an ongoing behavior support plan. Results suggested that performance feedback increased the treatment integrity of antecedent components for four of five teachers and consequence components for all five teachers. These results were maintained following feedback for all teachers across antecedent and consequence components.

Future research and/or staff trainings may look at methods of increasing efficiency of trainings. Possible options would be to use a BST package in a group setting, instead of training staff members on an individual basis. Groups of two to five individuals may be manageable. Another approach would be to use a pyramidal training approach. This would consist of training some participants to criterion and then requiring them to train additional staff members. For example, a BST package can be used to train supervisors in a group setting; these supervisors would then be responsible to train their subordinates.

The use of an intervention that consisted of multiple components (instruction, modeling, practice and feedback) is a limitation to the current study. Therefore, a determination cannot be made as to which component of the package produced a change in the instructional staff participants' behavior. Conducting a component analysis to identify

which component is most effective would benefit future research. This may also allow future trainings to decrease the amount of training time by increasing the efficiency of the training.

A second limitation to the present study is lack of a maintenance check. Follow-up data collected at one month, six months, etc. would demonstrate an even stronger effect of the BST package used if performance was maintained at or above criterion levels. If levels did not remain at criterion, determinations may be made as to what type of trainings could be implemented to retain the procedures learned (e.g. periodic refresher courses regarding PECS protocol).

An additional component of the present study that would be beneficial for future research is to assess student behavior following implementation of PECS. Limited research has been done on the implementation of PECS with nonverbal children and the effects on vocalizations (Charlop-Christy et. al., 2002). Other student behaviors that can be investigated are frequency of problem behaviors emitted, skill acquisition, and other social behaviors.

As previously mentioned, several studies have looked at different aspects of acquisition of PECS in children with ASD. Studies have evaluated the effects of PECS to decrease problem behavior such as tantrums, out-of-seat behavior, and other disruptive behavior (Carr, & Durand, 1985; Charlop-Christy, Le, LeBlanc, & Kellet, 2002; Durand & Carr, 1991; Durand & Merges, 2001); to increase vocalizations (Charlop-Christy et. al., 2002; Ganz, & Simpson, 2004); and for generalization of PECS to the natural environment (Schwartz, Garfinkle, Bauer, 1998). Though there are copious amounts of research supporting the use of PECS as a functional communication system, few studies have

empirically evaluated specific training protocols for proper implementation. This study extends previous research by providing evidence for the generalization of skills to a natural environment and with a learner with a diagnosis of autism. In addition, the replication of the use of an innovative training package designed by Rosales et. al. (2009) was shown to be effective in teaching implementation of Phases 1-3a of PECS. Future use of this training package will also help trainers to implement PECS as well as additional procedures, such as discrete trial trainings and preference assessments.

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*Table 1.* Signs and symptoms of an individual with an ASD.

| Developmental | Social | Physical | Behavioral |
|---|---|---|---|
| • Not respond to their name by 12 months.<br><br>•Not point at objects to show interest by 14 months.<br><br>•Not play "pretend" games by 18 months.<br><br>•Have delayed speech and language skills.<br><br>•Repeat words or phrases over and over (echolalia).<br><br>•Give unrelated answers to questions. | •Avoid eye contact and want to be alone.<br><br>•Have trouble understanding other people's feelings or talking about their own feelings.<br><br>•Get upset by minor changes.<br><br>•Have obsessive interests.<br><br>•Fail to develop peer relationships | •Stereotyped body movements such as: hand clapping, finger flicking, and body rocking, dipping, and swaying.<br><br>• Abnormal posture such as walking on tiptoe.<br><br>•Have unusual reactions to the way things sound, smell, taste, look or feel. | •Hyperactivity<br><br>•Short attention span<br><br>•Impulsivity<br><br>•Aggressiveness<br><br>•Self injurious behaviors<br><br>•Temper tantrums |

*Table 2.* Description of the six phases of PECS training according to guidelines set by Frost and Bondy (1994).

| Phase | Title | Content |
|---|---|---|
| 1 | Physical exchange | The child is taught to hand a picture card to a communicative partner. |
| 2 | Expanding spontaneity | The child is taught to go to his/her PECS board, get a picture card, seek out a communicative partner, and place the card in his or her hand to receive a reinforcer (mand training). The distance between the child, the board, and the listener is gradually increased and the response is trained in new settings. |
| 3 | Picture discrimination | The child is taught to discriminate among multiple pictures on the PECS board. |
| 4 | Sentence structure | The child seeks out their PECS board, creates a "sentence" on the sentence strip by combining the "I want card" and the card of a desired item, seeks out a communicative partner, and gives him or her sentence strip. The listener reads the strip back to the child, inserting a fixed delay between the words "I want" and the item label. Additional social praise is added if the child independently provides the label during the delay. |
| 5 | "What do you want?" | The child is taught to respond to the question, "What do you want?" |
| 6 | Commenting | The child is taught to respond to the question, "What do you see?" by selecting a card depicting the same object and combining it with an "I see" card to obtain an unrelated reinforcer (impure tact training or matching to sample). |

*Table 3.* Results of the social validity rating form.

| | **Participant 1** | **Participant 2** | **Participant 3** | **Avg.** |
|---|---|---|---|---|
| **1**. How clear is your understanding of the demonstrated procedures (phases 1-3a of PECS)? | 4 | 5 | 5 | 4.6 |
| **2**. How willing are you to implement the procedures as trained? | 5 | 5 | 5 | 5 |
| **3**. How effective did you find the training to be on your understanding of the subject matter? | 5 | 5 | 5 | 5 |
| **4**. How important do you find the trained procedures to be for the population you work with? | 5 | 5 | 5 | 5 |
| **5**. How willing would you be to adjust your classroom routine to implement these procedures when needed? | 5 | 5 | 5 | 5 |
| **6**. How beneficial do you think carrying out these assessments will be to student acquisition of skills? | 5 | 5 | 5 | 5 |

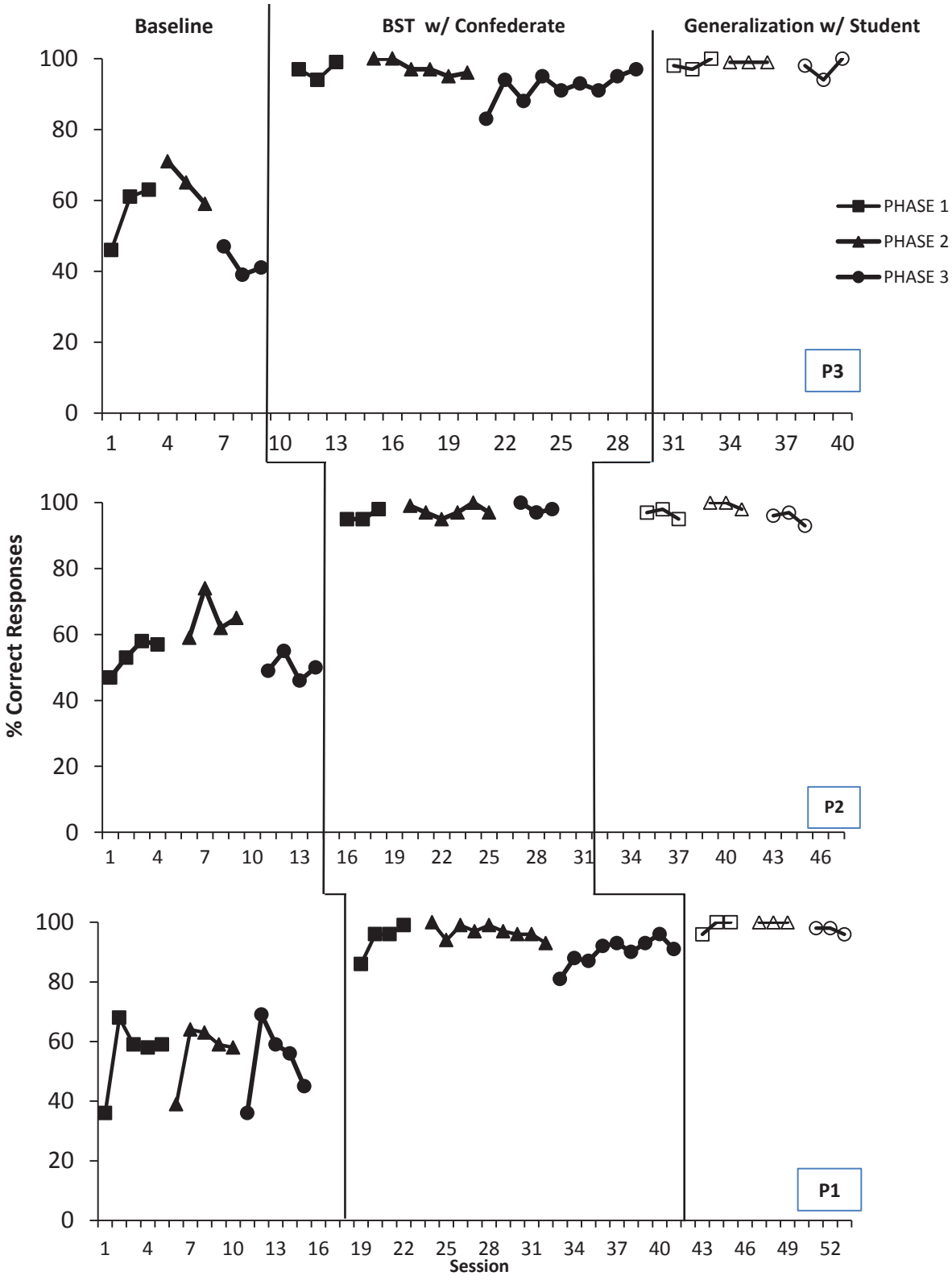


*Figure1.* Percentage of correct responses in five-trial blocks on checklists for Phases 1 through 3a during baseline, behavioral skills training and generalization.

# Appendix A

## Phase 1 Participant Responses

| Pre Session | Trial 1 | Trial 2 | Trial 3 | Trial 4 | Trial 5 |
|---|---|---|---|---|---|
| 1. Has training materials ready (binder, pictures of preferred items, preferred items). | | N/A | N/A | N/A | N/A |
| 2. Has data sheet and writing utensil ready. | | N/A | N/A | N/A | N/A |
| 3. Ensures preferred items are out of participant's reach. | | N/A | N/A | N/A | N/A |
| 4. Selects items for training that have been previously identified as preferred in a stimulus preference assessment. | | N/A | N/A | N/A | N/A |

| Session | Trial 1 | Trial 2 | Trial 3 | Trial 4 | Trial 5 |
|---|---|---|---|---|---|
| 5. Gives access to item right before training with a specific picture. | | | | | |
| 6. Places ONE picture that corresponds to ONE preferred item in hand on the table directly in front of the student. | | | | | |
| 7. Presents items to the student, but out of his or her reach. | | | | | |
| 8. Uses different item after every 5 trials or less. | | | | | |
| 9. Uses dime-sized pieces if edibles are used. | N/A | N/A | N/A | N/A | N/A |
| 10. Waits 1-2s for the student to respond. | | | | | |
| 11. If the student does not reach for the picture, gives an open hand prompt. | | | | | |
| 12. If the student does not reach for the picture after an open hand prompt, uses physical prompt (i.e. hand over hand) prompt. | | | | | |
| 13. Once the student has the picture in hand, waits for him/her to reach out, then opens on hand to receive picture. | | | | | |
| 14. Does not take the picture from the student (i.e. uses an open hand/flat palm). | | | | | |
| 15. Does not provide verbal prompts at any time. | | | | | |
| 16. When a correct response is emitted, provides appropriate response, (i.e. labeling of the item such as "I want" and access to item). | | | | | |
| 17. Provides reinforcement (i.e. access to item) on EVERY trial, regardless if prompting was required. | | | | | |
| 18. Gives access to preferred item for approximately 15-20s OR until student has consumed item in its entirety. | | | | | |
| 19. Correctly scores responses on data sheet immediately after each trial is complete. | | | | | |
| 20. Returns picture to table (or binder) while the student plays with or consumes item. | | | | | |
| **TOTAL SCORE** | | | | | |

# Appendix B

## Phase 2 Participant Responses

| Pre Session | Trial 1 | Trial 2 | Trial 3 | Trial 4 | Trial 5 |
|---|---|---|---|---|---|
| 1. Has training materials ready (binder, pictures of preferred items, preferred items). | | N/A | N/A | N/A | N/A |
| 2. Has data sheet and writing utensil ready. | | N/A | N/A | N/A | N/A |
| 3. Ensures preferred items are out of participant's reach. | | N/A | N/A | N/A | N/A |
| 4. Selects items for training that have been previously identified as preferred in a stimulus preference assessment. | | N/A | N/A | N/A | N/A |

| Session | Trial 1 | Trial 2 | Trial 3 | Trial 4 | Trial 5 |
|---|---|---|---|---|---|
| 5. Gives access to item right before training with a specific picture. | | | | | |
| 6. Places ONE picture that corresponds to ONE preferred item in hand on the table or binder directly in front of student. | | | | | |
| 7. Presents item to student, but out of his or her reach. | | | | | |
| 8. Uses different item after every 5 trials or less. | | | | | |
| 9. Uses dime-sized pieces if edibles are used. | N/A | N/A | N/A | N/A | N/A |
| 10. Sits at least 1 foot away from student. | | | | | |
| 11. Places binder on the table directly in front of student. | | | | | |
| 12. Waits 1-2 s for the student to respond. | | | | | |
| 13. If student does not respond, gives an open hand prompt. | | | | | |
| 14. If student does not respond to open hand prompt, uses physical prompt (i.e. hand over hand). | | | | | |
| 15. Once student has picture in hand, waits for him/her to reach out, then opens one hand to receive picture. | | | | | |
| 16. Does not take picture from participant (i.e. uses open hand/flat palm) to receive picture. | | | | | |
| 17. Does not provide verbal prompts at any time. | | | | | |
| 18. When correct response is emitted, provides appropriate response (i.e. label item "I want___" and access to item). | | | | | |
| 19. Provides reinforcement (i.e. access to item) on EVERY trial, regardless if prompting required. | | | | | |
| 20. Gives access to preferred item for 15-20s OR until student has consumed item in its entirety. | | | | | |
| 21. Correctly scores responses on data sheet after each trial is complete. | | | | | |
| 22. Returns picture to table (or binder) while student plays with or consumes item. | | | | | |
| 23. If student has responded correctly & independently on 2 consecutive trials, moves 1 ft. further away from student. | | | | | |
| 24. If student has not responded correctly & independently for 2 consecutive trials, moves 1 ft. closer to student on next trial. | | | | | |
| 25. AFTER student responded correctly & independently for 2 consecutive trial blocks with trainer 8 ft. away, moves binder at least 1 ft. away from student. | | | | | |
| 26. If student has responded correctly & independently on 2 consecutive trials, moves binder 1 ft. further away from student. | | | | | |
| 27. If student has not responded correctly & independently for 2 consecutive trials, moves binder 1 ft closer to student. | | | | | |
| **TOTAL SCORE** | | | | | |

# Appendix C

## Phase 3 Participant Responses

| Pre Session | Trial 1 | Trial 2 | Trial 3 | Trial 4 | Trial 5 |
|---|---|---|---|---|---|
| 1. Has training materials ready (binder, pictures of preferred items, preferred items). | | N/A | N/A | N/A | N/A |
| 2. Has data sheet and writing utensil ready. | | N/A | N/A | N/A | N/A |
| 3. Ensures preferred items are out of participant's reach. | | N/A | N/A | N/A | N/A |
| 4. Selects items for training that have been previously identified as preferred in a stimulus preference assessment. | | N/A | N/A | N/A | N/A |

| Session | Trial 1 | Trial 2 | Trial 3 | Trial 4 | Trial 5 |
|---|---|---|---|---|---|
| 5. Gives access to preferred item right before training with a specific picture to ensure item is preferred. | | | | | |
| 5a. Gives access to nonpreferred item right before training with a specific picture to ensure item is nonpreferred. | | N/A | N/A | N/A | N/A |
| 6. Places ONE picture that corresponds to ONE preferred item AND ONE distracter picture that is of a non-preferred item on binder. | | | | | |
| 7. Places binder directly in front of participant. | | | | | |
| 8. Presents preferred item to student out of his/her reach. | | | | | |
| 9. Uses dime-sized pieces if edibles are used. | N/A | N/A | N/A | N/A | N/A |
| 10. Uses different preferred item after every 5 trials or less. | | | | | |
| 11. Changes distracter picture after every 5 trials or less. | N/A | N/A | N/A | N/A | N/A |
| 12. Waits 1-2 s for the student to respond. | | | | | |
| 13. If student does not respond gives an open hand prompt. | | | | | |
| 14. If student does not respond to open hand prompt, uses physical prompt (i.e. hand over hand). | | | | | |
| 15. Once student has a picture in hand, waits for him/her to reach out, and then opens one hand to receive picture. | | | | | |
| 16. If student exchanges preferred item picture, reinforces with praise, labels item and gives access to item. | | | | | |
| 17. If student exchanges distracter picture, delivers distracter item and provides verbal feedback (i.e. says name of item). | | | | | |
| 18. If distracter picture is exchanged, uses *4-step error correction procedure*. | | | | | |
| 19. Shows or points to correct picture. | | | | | |
| 20. Holds open hand out. | | | | | |
| 21. If learner now gives correct picture, praises but DOES NOT give item. | | | | | |
| 22. Gives a "Do This" imitation trial to student (i.e. clap hands, etc.) | | | | | |
| 23. Waits a few seconds before presenting binder with pictures (2-3s). | | | | | |
| 24. Shows item and presents binder with both pictures. | | | | | |
| 25. If student now gives correct picture, praises and gives access to item. | | | | | |
| 26. If student does not give correct picture, performs steps 17-22. | | | | | |
| 27. Moves placement of pictures all around binder after each trial (i.e. not just switching left and right). | | | | | |
| 28. Correctly scores responses on data sheet immediately after each trial is complete. | | | | | |
| 29. Returns picture to table (or binder) while student plays with or consumes preferred item after each trial). | | | | | |
| **TOTAL SCORE** | | | | | |

## Appendix D

### Treatment Integrity Phase 1

| **Baseline** | **Trial 1** | **Trial 2** | **Trial 3** | **Trial 4** | **Trial 5** |
|---|---|---|---|---|---|
| 1. Provides participant with all needed materials to conduct session for Phase 1 (data sheet, writing utensil, pictures of preferred items, preferred items). | | | | | |
| 2. Gives instruction: "Do 5 trials of phase 1 to the best of your ability". | | | | | |
| 3. Completes missed or skipped steps of task analysis for participant if they need help. | | | | | |
| 4. Does not provide any corrective or approving feedback at any time. | | | | | |
| **TOTAL SCORE** | | | | | |

| **Training** | **Trial 1** | **Trial 2** | **Trial 3** | **Trial 4** | **Trial 5** |
|---|---|---|---|---|---|
| 1. Provides participant with all needed materials to conduct session for Phase 1 (data sheet, writing utensil, pictures of preferred items, preferred items). | | | | | |
| 2. The experimenter verbally describes each step on the participant response checklist. | | | | | |
| 3. The experimenter models each step on the checklist with either the confederate or student learner. | | | | | |
| 4. Instructs the participant to refrain from asking questions until after all 5 trials are completed. | | | | | |
| 5. Gives instruction: "Do 5 trials of phase 1 to the best of your ability". | | | | | |
| 6. Completes missed or skipped steps of task analysis for participant if they need help. | | | | | |
| 7. Gives participant either corrective (i.e. "wait 5s before prompting student/confederate to choose a picture") or approving (i.e." good job waiting for the student to reach towards you with the picture before opening your hand") feedback. | | | | | |
| **TOTAL SCORE** | | | | | |

## Appendix E

**Treatment Integrity Phase 2**

| **Baseline** | **Trial 1** | **Trial 2** | **Trial 3** | **Trial 4** | **Trial 5** |
|---|---|---|---|---|---|
| 1. Provides participant with all needed materials to conduct session for Phase 2 (data sheet, writing utensil, binder, pictures of preferred items, preferred items). | | | | | |
| 2. Gives instruction: "Do 5 trials of phase2 to the best of your ability". | | | | | |
| 3. Completes missed or skipped steps of task analysis for participant if they need help. | | | | | |
| 4. Does not provide any corrective or approving feedback at any time. | | | | | |
| **TOTAL SCORE** | | | | | |

| **Training** | **Trial 1** | **Trial 2** | **Trial 3** | **Trial 4** | **Trial 5** |
|---|---|---|---|---|---|
| 1. Provides participant with all needed materials to conduct session for Phase 2 (data sheet, writing utensil, binder, pictures of preferred items, preferred items). | | | | | |
| 2. The experimenter verbally describes each step on the participant response checklist. | | | | | |
| 3. The experimenter models each step on the checklist with either the confederate or student learner. | | | | | |
| 4. Instructs the participant to refrain from asking questions until after all 5 trials are completed. | | | | | |
| 5. Gives instruction: "Do 5 trials of phase 2 to the best of your ability". | | | | | |
| 6. Completes missed or skipped steps of task analysis for participant if they need help. | | | | | |
| 7. Gives participant either corrective (i.e. "make sure you increase your distance from student") or approving (i.e." good job waiting for the student to reach towards you with the picture before opening your hand") feedback. | | | | | |
| **TOTAL SCORE** | | | | | |

## Appendix F

**Treatment Integrity Phase 3**

| **Baseline** | **Trial 1** | **Trial 2** | **Trial 3** | **Trial 4** | **Trial 5** |
|---|---|---|---|---|---|
| 1. Provides participant with all needed materials to conduct session for Phase 3 (data sheet, writing utensil, binder, pictures of preferred items, preferred items, pictures of distracter items, distracter items). | | | | | |
| 2. Gives instruction: "Do 5 trials of phase 3 to the best of your ability". | | | | | |
| 3. Completes missed or skipped steps of task analysis for participant if they need help. | | | | | |
| 4. Does not provide any corrective or approving feedback at any time. | | | | | |
| **TOTAL SCORE** | | | | | |

| **Training** | **Trial 1** | **Trial 2** | **Trial 3** | **Trial 4** | **Trial 5** |
|---|---|---|---|---|---|
| 1. Provides participant with all needed materials to conduct session for Phase 3 (data sheet, writing utensil, binder, pictures of preferred items, preferred items, pictures of distracter items, distracter items). | | | | | |
| 2. The experimenter verbally describes each step on the participant response checklist. | | | | | |
| 3. The experimenter models each step on the checklist with either the confederate or student learner. | | | | | |
| 4. Instructs the participant to refrain from asking questions until after all 5 trials are completed. | | | | | |
| 5. Gives instruction: "Do 5 trials of phase 3 to the best of your ability". | | | | | |
| 6. Completes missed or skipped steps of task analysis for participant if they need help. | | | | | |
| 7. Gives participant either corrective (i.e. "make sure if the student chooses picture of distracter item you don't attempt to correct them") or approving (i.e." good job waiting for the student to reach towards you with the picture before opening your hand") feedback. | | | | | |
| **TOTAL SCORE** | | | | | |

## Appendix G

## Social Validity Rating Form - Implementation of the Picture Exchange Communication System

1. How clear is your understanding of the procedures demonstrated in this study (phases 1-3 of PECS)?

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Not at all clear | | Neutral | | Very clear |

2. How willing are you to implement the procedures as trained?

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Not at all willing | | Neutral | | Very willing |

3. How effective did you find the training to be on your understanding of the subject matter?

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Not all clear | | Neutral | | Very clear |

4. How important do you find the trained procedures to be for the population you work with?

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Not at all important | | Neutral | | Very important |

5. How willing would you be to adjust your classroom routine to implement these procedures when needed?

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Not at all willing | | Neutral | | Very willing |

6. How beneficial do you think carrying out these assessments will be to student acquisition of skills?

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Not at all beneficial | | Neutral | | Very beneficial |

# Appendix H

## Confederate Responses Phase 1

1. Pick up picture card and reach out towards participant.
2. Reach for item without picking up the card first.
3. Pick up card but do not reach towards trainer, or play with card.
4. Make no response - do not pick up card or reach for item.
5. Pick up card and reach out to trainer only after they provide an open hand prompt.
6. Pick up card and reach out to trainer only after they provide a physical prompt.
7. Pick up card and throw it to the ground or at the trainer.
8. Get out of your seat.
9. Reject item.

# Appendix I

**Confederate Responses Phase 2:**

1. Pick up card, walk over to trainer and reach out with card in hand.
2. Pick up card but don't move towards trainer, play with card.
3. Walk directly to trainer without picking up card first.
4. Hold out hand or try to reach for item without picking up card first.
5. Pick up card and walk towards trainer only after they provide an open hand prompt.
6. Pick up card and throw it at the trainer or on the ground.
7. Respond correctly and independently two consecutive times.
8. Wait until prompted two times in a row.

## Appendix J

**Confederate Responses Phase 3:**

1. Select preferred item card and reach out towards trainer.

2. Select distracter card and reach out towards trainer.

3. Select preferred item card and throw it at trainer or on ground.

4. Select distracter card and throw it at trainer or on ground.

5. Select preferred item card only after trainer goes through correction procedure.

6. Select distracter card again after trainer goes through correction procedure.

7. Reach for preferred item without picking up or exchanging the card.

8. Select distracter card and reach out to trainer to exchange picture, then immediately reach for preferred item picture after trainer provides access to distracter item

9. Pick up both preferred and distracter card.

10. Select both preferred and distracter card.

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September 20, 2010

Dr. Rocio Rosales, Principal Investigator
Ms. Christa Homlitas, Co-investigator
Department of Psychology
UNIVERSITY

RE: HSRC PROTOCOL NUMBER: 013-2011
TITLE: Effects of Behavior Skills Training on Implementation and Generalization of the Picture Exchange Communication System

Dear Dr. Rosales and Ms. Homlitas:

The Human Subjects Research Committee of Youngstown State University has reviewed your response to their concerns regarding the above mentioned protocol and determined that your protocol now meets YSU Human Subjects Research Guidelines. Therefore, I am pleased to inform you that your project has been fully approved.

Please note that your project is approved for one year. If your project extends beyond one year, you must submit a project Update form at that time.

Any changes in your research activity should be promptly reported to the Human Subjects Research Committee and may not be initiated without HSRC approval except where necessary to eliminate hazard to human subjects. Any unanticipated problems involving risks to subjects should also be promptly reported to the Human Subjects Research Committee.

We wish you well in your study.

Sincerely,

Peter J. Kasvinsky
Associate Provost for Research
Research Compliance Officer

PJK:cc

c: Dr. Karen Giorgetti, Chair
Department of Psychology