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Teaching a non-vocal student with autism to use picture exchange communication systems (PECS): Effects of various prompting and item placement strategies

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Abstract

A purpose of case report was to teach a young preschool student with autism to request for food or drink using a Picture Exchange Communication System (PECS) across several prompting strategies. The number of independent exchanges served as our dependent variable. Various prompting and icon placement strategies were employed to determine an effective strategy (i. e. no prompt, full prompt, partial prompt, open hand prompt with icon on table, no prompt with icon on the table, no prompt with icon on carpet, no prompt with icon on cardboard) for our participant. The outcomes were evaluated in an ABCDEFGH single case design. The overall outcomes indicated that independent exchanges did not occur until an open hand prompt with the icon on the table was employed. Increases in independent exchanges were found all other prompt phases. Prompts were faded and the icons were placed on a Velcro strip and were maintained. The strengths and limitations of the procedures were discussed.

Keywords: PECS, ASD, Preschool Student, Single Case Research Design, Prompting Strategies

Introduction

Most young children are fortunate to develop a vocal speech pattern that others can understand. For many students with disabilities this may not be the case (1). For those who cannot speak, there are alternatives forms of communication that allow them to communicate with others in their environment. These alternatives can range from sign language, picture exchange systems (PECS), and talk boxes. Having an effective communication system helps reduce behavior problems and helps develop a repertoire. It helps develop a more independent quality of life for students with and without disabilities (1).

As outlined by Stoner, Beck, Bock, Hickey, Kosuwan, and Thompson (2) the Picture Exchange Communication System (PECS) is a form of augmentative/alternative communication that has been developed to teach nonspeaking individuals functional communication skills that are self-initiation. With PECS, the communicator uses pictures to expressively convey information and messages. Pecs' instruction typically involves six phases, starting with teaching the learner to exchange a picture of a preferred item or activity for the actual item or activity (3, 4, 5, 6). When all six phases have been taught, the individual will usually be able to communicate using picture icons. PECS was originally developed for use with children with autism spectrum disorder (ASD), building on these children's visual strengths and learning styles (2). Bondy and Frost (4) reported data on 85 children who were taught to use PECS. None of the children had a functional communication system before PECS training was initiated. After training, 95% of the children had learned to use two or more pictures within the PECS format.

Kravits, Kamps, Kemmerer, and Poucek (7) found that using PECS increased both the non-verbal and verbal communication of children with ASD. They also reported that their participant gained skills in spoken language. Two recent randomized control design studies (8, 9) found the efficacy of employing PECS was significantly high. However, both studies failed to report generalization or maintenance to other areas of responding for children with autism. The positive contribution of teacher training for using PECS was modest in both studies. Another advantage of PECS is that such a system can be implemented regardless of the student's native language. This may make PECS training highly applicable for non-vocal

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children throughout the world. Finally when communication strategies are learned, the frequency of challenging behaviors for such students is reduced.

Autism is a complex neurobiological disorder that typically lasts throughout a person's lifetime (10). It is part of a group of disorders known as autism spectrum disorders (ASD). Symptoms can range from very mild to quite severe (1). The prevalence of 1 in 150 individuals being diagnosed with autism makes it more common than pediatric cancer, diabetes, and AIDS combined (1). Autism occurs in all racial, ethnic, and social groups and is four times more likely to strike boys than girls. The most prevalent system is that autism impairs a person's ability to communicate and relate to others (10). It has also been suggested that 25% of persons with autism will never obtain functional speech (11, 12). PEC's have been suggested as an important evidence-based approach to teach students with autism skills in communication. Finally, when children with autism are taught communication skills, their rates of challenging behaviors decline (13, 14),

The purpose of this study was to teach a nonvocal preschool child to use a picture exchange communication system (PECs) to request a highly preferred food item. We hypothesized that employing PECs would be an effective tool for a preschool student with autism to request tangible items. Food was selected as a consequence because it has been shown to be a highly effective positive reinforcer across a wide range of individuals and behaviors (15). In addition, a recent review of thirty-four studies dealing with PECs found that for persons without speech PECs were a functional form of communication (16).

Method

Participant and Setting

The participant of this study was a 5 five-year-old male diagnosed with autism. This diagnosis was completed by the child's pediatrician. He was chosen as our participant by the classroom teacher (fourth author) because increasing his skills in communication was a goal on his IEP (Individual Education Plan). In addition, he did not use any form of communication that was understandable except for the "eee" sound. He would make this sound when he liked something or when crying in discomfort. He spent most of the time in the classroom attempting to engage in high rates of hand mouthing. His teacher reported he did not show progress with his communication skills prior to the implementation of PECs in his current placement. We were unable to determine if he had prior exposure to the PECS in his previous preschool placement. The participant received speech, occupational, and physical therapy services for approximately 30 minutes per week through out the investigation.

The study took place in a self-contained special education preschool classroom. The classroom was located in a special day school that housed various district programs ranging from Head Start, home school assistance for parents, and various classroom configurations for students with autism. The setting was specifically set up for children ages three- five years with autism and/or developmental delays. The classroom context consisted of eight students, the lead teacher, two instructional assistants, a student teacher (first author), and on occasion support personnel such as an occupational therapist (OT) or the

speech and language pathologist (SLP). Sessions took place every day during snack time, which was around 2:30 p.m. These sessions were typically conducted by the first author, and lasted for approximately 5 to 10 minutes. This classroom has been employed in several additional projects (17, 18, 19, 20). The goal or goals of these projects have ranged from self-help skills to handwriting legibility.

Materials

Materials included two picture icons, one for cracker and one for drink. The icons depicted either gold fish or graham crackers. The drink icon consisted of either grape juice, orange juice, or bottled water. Other materials included a cup, a "12 by 12" (approximate) carpet square, and a cardboard square approximately 3"x 4" with a strip of Velcro attached.

Dependent Variable and Measurement

The number of independent exchanges of a picture icon to gain access to a preferred food or drink item during the five-minute training period served as the dependent measure. An independent icon exchange was defined as the participant independently picking up the picture icon with his hand and handing it to the first author. Any response by the participant that required any form of physical prompting was not scored as an independent exchange. Also, if the participant did not place the icon in the first author's hand it was not included as an independent exchange.

Experimental Design and Conditions

An ABCDEFG single case time design (21, 22) was employed. The conditions were- A: baseline, icon on table, B: full prompt (hand-over-hand), icon on table, C: partial prompt (h-o-h), icon on table, D: open hand prompt, icon on table, E: no prompt, icon on table, F: no prompt, icon on carpet square, G: no prompt, icon on cardboard strip. Sessions were five minutes in duration across all conditions. The reason we employed a case study design was to adhere to the participant's IEP goals. That is, his goals called for the use of PECs across a wide range of stimulus contexts.

Baseline. During baseline (phase A), the participant sat at the table and a picture icon of either a fish cracker or a drink was placed in front of the participant. The food items were present and visible to the participant. The participant was given approximately 30s to independently hand the PEC to the first author. After the 30s had elapsed, the first author would remove the picture icon and present either the new icon or the same one again.

Picture exchange communication system, phase B: Full prompt (h-o-h), icon on table. During phase B the first author sat to the side and in front of the participant. There was an instructional assistant (IA) behind the participant to facilitate compliance. The icon was placed on the table and the participant was given approximately five seconds to respond. After the five seconds elapsed, the assistant provided a full hand-over-hand prompt to pick up the picture icon and hand it to the first author. The first author immediately gave the requested item (i. e., cracker or drink). Feedback was given in the form of verbally saying what the participant had requested along with the praise

statement, “nice asking” intermittently throughout the session. The first author attempted to maintain as much eye contact throughout the session. Data were not recorded because this type of exchange was not viewed as an independent exchange.

Picture exchange communication system, phase C: Partial prompt (h-o-h), icon on table. During phase B, the first author sat to the side in front of the participant and with the IA placed behind the participant. The assistant was employed to facilitate compliance. The icon was placed on the table and the participant was given approximately five seconds to respond appropriately. After the five seconds elapsed, the instructional assistant provided a partial hand-over-hand prompt to pick up the picture icon and hand it to the first author. The first author immediately gave the participant the requested item (i. e. cracker or drink). Feedback was given in the form of verbally saying what the participant had requested along with the praise statement, “nice asking” intermittently throughout the session. The first author tried to maintain as much eye contact as possible. Toward the end of the sessions, the prompt was faded to an elbow tap being used as a partial prompt, this indicated to the first author that it was appropriate to move on to the next phase. Tally marks were not recorded because this type of exchange did not qualify as an independent exchange. At this point physical prompts were completed faded and the instructional assistant was no longer used.

Picture exchange communication system, phase D: Open hand prompt, icon on table. During phase D, the first author presented the icon to the participant on the table then held an open hand about 12 inches away from the participant. This served as a prompt for the participant to put the icon into the first author’s hand. Upon handing the picture icon to the first author the participant received the preferred food or drink item paired with the vocal statement “You want (food item)” or “(food item)?”. The first author would move her hand over the food item as an additional prompt that the icon needed to be handed to the first author to gain access to the item. Once this was established and the trend of independent exchanges was observed via visual inspection, the first author moved onto the next phase. Data were recorded on the number of independent exchanges.

Picture exchange communication system, phase E: No prompt icon on table. During phase E, the first author placed the picture icon on the table. The participant was required to pick up the icon and hand it to the first author, the first author would then open her hand; upon the participant putting the icon in the first author’s hand the first author would say, “You want (food item)” or “(food item)?” and the item requested was provided. Data were recorded according to how many independent exchanges occurred. Independent exchanges remained well above baseline levels when we moved to the next phase.

Picture exchange communication system, phase f: No prompt, icon on carpet Square. During phase F, the first author placed a large 12”x12” square piece of carpet on the

table. The first author then placed the icon on the carpet square and followed the same procedures used in phase E. This was the first step toward providing some extra training for the picture icon. The first author moved on to the next phase when a positive trend was established.

Picture exchange communication system, phase g: No prompt, icon on cardboard Strip. During phase G the first author placed the picture icon on a small piece of cardboard measuring 3”x4” that had a Velcro strip. The exact same procedure was followed as presented in phase E.

Reliability of Measurement and Fidelity of Implementation of the Independent Variables

Two independent observers took data to measure reliability. Both were positioned in a place in the room that did not allow them to observe each other’s recording. These data were gathered during each of the various experimental phases. Time was kept by using the wall clock. The master teacher took reliability of measurement on 7 of the 19 sessions. The formula for calculating the reliability of measurement was the smaller number of independent exchanges recorded divided by the larger and multiplying by 100. Interobserver agreements ranged from 82% to 100% with an overall mean of 95%. Reliability as to the implementation of the various procedures was gathered twice. Reliability was taken twice as to the correct implementation of the various experimental phases was 100%.

Results

A can be seen in Figure 1, the number of independent exchanges per five minutes increased as prompting was faded. During the first three phases of this study (baseline, full prompt o-h-o partial prompt o-h-o), our participant had no independent exchanges. When the open hand and icon on the table condition was implemented, independent exchanges increased ($M = 13.3$; range 9 to 19). When prompts were completely faded and only the icon was on the table, his performance remained stable ($M = 13$; range 10 to 16). When prompts were no longer provided and the icon was placed on a piece of carpet, his performance improved ($M = 13.75$; range 9 to 18). During the last phase, when the icon was placed a cardboard strip, the number of independent PEC’s exchanges showed an increasing trend ($M = 16$).

These data were then examined using a Friedman nonparametric analysis of variance (23). This test indicated significant differences among the various experimental phases. A Friedman analysis of variance test (23) was carried between each condition. There were no significant differences between any of the first three phases ($Xr^2 = .000$; $p = .000$; NS), but significant differences between conditions ($Xr = 9.37$; $p = .0154$). Follow-up Wilcoxon-signed-ranks tests found a significant difference between the first three phases and each of the last four phases (oho and icon on the table, no prompt icon on the table, no prompt icon on the carpet, and no prompt, icon on a sheet of cardboard phases ($Z = -2.033$; $p = .0431$). None of the prompt absent phases (D through F) was significantly different from one another ($Xr^2 = .011$; $p = .998$; NS).

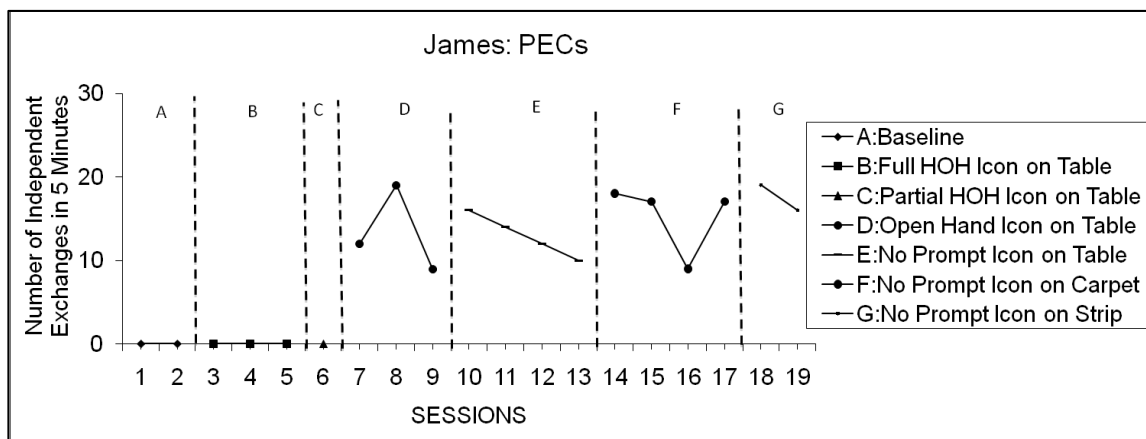


Fig 1: The number of independent PEC exchanges per five minutes for the participant for each condition.

Discussion

Teaching our participant to use a picture exchange communication system to request was successful. The results clearly show improvement from baseline through all prompting strategies. The results occurred because gaining access to a preferred food and drink item appeared to be reinforcing enough for the participant to learn this functional communication skill. As stated before, there are six phases to the PECs (5, 2) but only the first level of picture exchange was taught in the current investigation. After seeing the outcomes with our participant, the preschool teacher reported she would continue to follow the PECs training guidelines across the six remaining six phases. Through the use of these procedures, our participant may have begun to open a door for language and communication.

The strengths of this study include the cooperation from the preschool teacher and the speech therapist, as well as the compliance by the participant. These data were quite positive to all involved. The teaching sessions were easy to conduct and fit into the preschool schedule. The long-term goal is for generalization of using the PECs across all settings, including home. The picture icons are readily available on computer programs or can be constructed as needed (2).

There were several limitations in the present case report. A limitation of the study is that there was only one participant. The use of the beginning stages of PECS to more than one individual would have provided stronger evidence (21, 22, 24). Another limitation was the health status of our participant. He suffered from severe eczema. Many times the participant would be itching and crying so much that it may have interfered with the number of exchanges that could have occurred. It should be noted that during phase E, the participant had an especially trying week; eczema flare-ups, a different person conducted the intervention, and it followed a long weekend. Another limitation was the type of experimental design that was employed. A return to baseline during icon placement training or employing an alternating-treatments design (21) with subsequent replications would have added strength to our findings. However due to time constraints and the participant's IEP goals, these did not take place. Even though, we were able to provide anecdotal evidence that teaching our participant to independently mand led to a decrease in his challenging behaviors (13, 14). However, without taking data each session on this issue, we cannot document this finding empirically. Future research should

examine this issue and also determine if the use of PECs function as a schedule for developing consistency in the child's setting or some other function.

Again, our hope is that our participant will continue to develop communication skills through the other five phases of the PECS and generalize them across different settings. The teacher, speech pathologist and occupational therapist have indicated their commitment to the success of the participant through this skill building process. The present case report adds to the large and growing evidence-base of employing PECS in the schools or in the home (3, 4, 5, 25, 26, 27, 8, 7, 28, 2, 16, 9). Clearly additional research needs to take place with larger numbers of students and across a wide range of disability groups.

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MS. Milena Robison has retired from Spokane Public Schools. Ms. Ahrends is an early childhood special education teacher in Central Valley School District. She teaches at the Early Learning Childhood Center.

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