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## **The Picture Exchange Communication System**

Andrew S. Bondy and Lori A. Frost  
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### The Picture Exchange Communication System

Andrew S. Bondy and Lori A. Frost

*A variety of strategies have been used to help children with autism acquire functional communication skills. The Picture Exchange Communication System (PECS) is a unique communication training program that was developed as a means of circumventing some shortcomings associated with these strategies. A description of the steps within PECS is provided. Long-term group data have indicated that a large proportion of children started on PECS as preschoolers acquire speech. Individual and group data supporting the use of PECS are provided.*

A fundamental goal of teaching children with autism is improved communication, the most socially acceptable form of which is speech. A large proportion of very young children with autism (those under 5 years of age) enter formal programs without speech or other behaviors that are interpreted as having communicative intent. For example, during the past 6 years, 80% of the children 5 years old and younger entering the Delaware Autistic Program have not displayed functional communication skills (Bondy & Frost, 1994). For these children, the pace of acquisition of functional communication skills is often the key prognosticator of long-term success. Therefore, it is not surprising that those who have worked with children with autism have put great effort into teaching these children to talk. However, it appears that when children with autism are directly taught to talk, the rate of speech acquisition is generally slow; and even when the effort proves successful, a tremendous amount of work is required of children and staff (Carr, 1982).

Aside from speech, another avenue for teaching functional communication skills has involved the use of alternative or augmentative communication systems (Reichle, York, & Sigafos, 1991). These systems include sign language, either alone or in combination with speech; electronic communication devices; or "low-tech" communication systems that use either abstract symbols or pictures with varying degrees of symbolic representation. Although successes have been reported with these training programs, the current literature documents few, if any, attempts at using these systems with children under the age of 5 (S. Blackstone, personal communication, 1991).

Many of these traditional language programs, including speech (Guess, Sailor, & Baer, 1976; Kent, 1974; Kozloff, 1974; Lovaas, 1977; Romanczyk, Matey, & Lockshin, 1994) and sign language (Carr, Binkoff, Kologinsky, & Eddy, 1978), have several elements in common. Each program assumes that attending (including eye contact) and motor and verbal imitation skills are prerequisites to learning functional language (e.g., Romanczyk et al. call them "prespeech attentive skills"). Typically developing children learn each of these skills, in part, because of their associated social consequences (Bijou & Baer, 1965). Very young children with autism are not highly responsive to these types of rewards, and, thus, training protocols must include nonsocial rewards (Bondy, 1988). For example, a child with autism may be given candy for looking into the teacher's eyes. This type of training may require weeks, or even months (Carr, 1982), and success is often

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required before formal training in functional communication can begin. Such attending may take the form of normal eye contact, but because it does not have the same consequences, it does not serve the same function. Furthermore, such training does not teach the child to initiate social contacts but, rather, focuses upon how he or she should respond to social approaches by teachers and other adults.

Certain augmentative or alternative communication systems involving the use of pictures have avoided some of the issues associated with initial attempts to teach eye contact and imitative skills (Reichle et al., 1991). These picture-based systems have required the student to point to pictures (or touch and/or tap them). Traditionally, pointing to pictures has followed a matching-to-sample format, wherein the child is taught to match objects to objects, objects to pictures, and then pictures to objects (Carrier & Peak, 1975). Training generally involves teaching children to respond to verbal prompts such as "Point to the picture of the cup," or "Show me the cup." This type of responding may be relatively easy for typically developing children or children with non-socially based handicaps because these actions are primarily rewarded and maintained by social reactions. However, such consequences are weak motivators for preschool children with autism. Another difficulty sometimes encountered when attempting to teach preschoolers with autism to point to pictures is the self-stimulatory actions that may be engendered by such stimuli. When a child taps on the picture of a cookie while staring out the window, teachers may rightfully wonder whether the child has engaged in a communicative exchange. Finally, learning to point to pictures does not ensure that someone will always be there to "listen" to the child; that is, the child can point to a picture while alone (Ryan, 1990; Ryan & Bondy, 1988; Ryan, Bondy, & Finnegan, 1990).

Programs that involve speech, sign, or picture-pointing systems often teach labeling as the first communicative skill (Carr, 1982; Powers & Handleman, 1984). Skinner (1957), however, suggested that labeling (a "tact" in Skinner's terminology) is maintained by educational or social reinforcers. On the other hand, requesting (a type of "mand") is maintained by its specified consequences (e.g., receipt of a cookie after asking for a cookie), not by socially based reinforcers. Labeling is not the best initial communicative function to teach children with autism, because the type of reinforcement necessary to teach it is either very weak or nonexistent (Bondy, Finnegan, Ryan, & Wachowiak, 1989). Requesting should be the first skill taught because it is maintained by specified, typically concrete, and effective reinforcers. This skill is likely to be learned rapidly because the child can immediately receive what is wanted (Bondy & Ryan, 1991).

The purpose of this article is to describe a communication training system, the Picture Exchange Communication System (PECS), developed within the Delaware Autistic Program (DAP). PECS permits teaching very young children a means of communicating within a social context (Bondy, 1987, 1988; Ryan, 1990; Ryan, Finnegan, McLaughlin, Swanson, & Wachowiak, 1987). To the best of our knowledge, DAP was the first program to use a picture-based system with children with autism as young as 2 years of age and to promote this system as a child's initial mode of communication. Children using PECS are taught to give a picture of a desired item to a communicative partner in exchange for the item. By doing so, the child initiates a communicative act for a concrete outcome within a social context. We will describe how this system is introduced to very young children who may not display any form of functional or socially appropriate communication skills. Table 1 displays a comparison between PECS and other communication training approaches regarding prerequisites, training objectives, and general outcome issues. A case presentation will be reviewed, followed by examples of long-term outcome measures for children who have used this system.

**TABLE 1**  
Comparison of Communication Training Procedures Designed to Promote Speech,  
Sign, Picture-Point Systems, and Picture Exchange (PECS)

	Speech	Sign	Picture-Point	PECS
<b>Prerequisites</b>				
Eye contact/ attending	Yes	Yes	No	No
Imitation (verbal and/or motor)	Yes	Yes	No	No
Match-to- sample	No	No	Yes	No
<b>Requires</b>				
Social R+ or arbitrary R+	Yes	Yes	Yes	No
Child preselects R+	No	No	No	Yes
Initial response: imitate/label	Yes	Yes	Yes	No
Initial response: request	No	No	No	Yes
<b>Outcome</b>				
Child initiates response	No	No	No	Yes
Child initiates social inter- action	No	No	No	Yes
Rapid acquisition	Rarely	Rarely	Rarely	Usually
Universally understood	Sometimes	Sometimes	Yes	Yes

*Note.* R+ means "reinforcer."

### Phase 1: Teaching the Physically Assisted Exchange

It has been observed that young children with autism are not strongly influenced by social rewards (Ferster, 1961; Kanner, 1943). Therefore, it is imperative that communication training begin with functional acts that bring the child into contact with reinforcers. These rewards must be effective and readily identifiable by observers. Communicative acts that bring the child desired items can be taught only if the trainer knows (via consistent observation) what a child wants. The first step in PECS, therefore, is to determine what items the child persistently wants. Although a variety of techniques exist for carrying out this assessment (Reichle & Sigafos, 1991), it is often sufficient to place an assortment of objects on a table and observe what the child picks up and either plays with or consumes.

At this point in PECS, it is extremely important NOT to ask the child what he or

she wants (e.g., "What do you want?" "Show me what you want," "Do you want this one?" etc.), as this cue adds an unnecessary verbal prompt to the sequence. Such verbal prompts may result in prompt-dependent learning (see Mirenda & Dattilo, 1987, for a discussion of verbal prompt-free procedures). Rather, the trainer merely arranges the environment and observes the child's selections.

When preferences emerge (e.g., the child picks up a small piece of pretzel several times in a row), the trainer removes all items except the desired one. Then, with the desired object in full view, and the child beginning to reach for it, the trainer places a picture of the referent into the child's hand (see Note 1). While the child is holding the picture, the trainer (or an assistant) physically guides the child to release the picture into the trainer's outstretched hand (or the other trainer's hand). As soon as the child releases the picture into the trainer's hand, the trainer immediately gives him or her the pretzel, smiles, and says something like "Oh, you want the pretzel? Here it is!" This step is the first exchange that the child makes — the picture is exchanged for the object. The trainer does not refer to the exchange itself ("You gave me the picture!") but, rather, responds as if the child had spoken. An acceptable alternative strategy is to place the picture between the child and the object and to physically prompt the child, as he or she is reaching for the object, to pick up the picture from the tabletop and give it to the trainer (see Note 2).

The trainer continues to arrange the environment by putting desired items (e.g., pieces of pretzel) on the table, along with the picture. The trainer avoids verbally prompting the child to pick up or give the picture, or to initiate an exchange. Physical guidance in picking up the picture is faded over time (starting with fading of releasing the picture into the open hand), and the trainer continues to show the child an open hand whenever the child picks up the picture. An important aspect of this phase is to be certain to give the child a piece of pretzel every time one is requested. Denying access to a requested item, although a natural consequence in the real world, would not sufficiently strengthen the picture exchange at this early stage of acquisition (see Note 3). Once the student is reliably picking up the picture and reaching toward the trainer's open hand, the trainer fades this open-hand cue by waiting increasingly longer to show his or her hand once the student has picked up the picture. By the end of this phase, the child can pick up a single picture, usually from the table top, give it to the trainer, and receive the requested item.

## Phase 2: Expanding Spontaneity

During Phase 1 the trainer is in front of or immediately next to the child; the child merely has to extend the picture to arm's length to put it into the trainer's hand. During Phase 2 the trainer gradually moves away from the child and also moves the communication board farther from the child so that she or he learns to go get the picture and approach the communicative partner to initiate the exchange. We have found it important to avoid promoting a passive response (i.e., having the adult anticipate the exchange to the point where the child only touches the picture before the adult reacts). Rather, the child is taught to persist in attempting to place the picture into the trainer's hand. This emphasis on child mobility also promotes a general orientation toward the communicative partner, and in particular, toward the trainer's hand. It is important to vary the receiving trainer very early in PECS training so that the child will initiate the exchange with many different people.

This increased orientation to the trainer may promote increased eye contact, but not in every case. With regard to eye contact, if the child does not begin to respond to the trainer's face, then the child should be made to understand the importance of

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meeting the adult's gaze before an exchange can take place. Training on this objective may be facilitated by using two teachers, one who exaggerates looking away from the child as the child approaches with a picture while the second staff models or physically prompts the child to touch the first adult's face or shoulder. Upon the touch, the receiving teacher looks expectantly at the child, who may now "deliver the message." In this manner, having the adult look at the child becomes important to the latter as a necessary step to handing over a picture.

Although picking up and giving a picture may seem a minor variation from the pointing procedures described earlier, there are several substantial differences. First, with PECS there is no need to initially teach the child to make eye contact with the trainer or to imitate something the trainer does. Thus, during the very first lessons, the child is taught a skill that is immediately functional and that promotes control over the relevant aspects of the environment. Second, the exchange requires the child to initiate an approach to an adult. Thus, the exchange occurs within a social context that is often missing in picture-point systems. Third, this phase avoids the use of verbal cues that preclude "spontaneous" communication or that result in the child becoming prompt dependent. Finally, the reactions of the trainer are natural in that they include commenting about the child's communication (e.g., "You want the cookie!" etc.) and providing him or her with precisely what the child wants – the requested object (not the trainer's approval).

During Phase 2 the child learns to initiate communicative exchanges more spontaneously by completing the exchange without subtle trainer prompts. Again, no verbal prompts are used during this phase. Because the student is likely to desire a variety of items, additional pictures are introduced without any requirements for discrimination. Rather, the child learns to produce the picture exchange using a variety of pictures made available one at a time. At this point, the child is taught to request a variety of significantly different reinforcer types. If he or she had learned to request an edible in Phase 1, trainers would present toys, books, balls, and other nonedible referents for Phase 2. Although the variety of potential reinforcers taught during this phase is somewhat limited by the child's preferences and selections, it is important that the child learn to use PECS to access a wide range of reinforcers and avoid associated "requesting" with only one type of need or context.

The trainer continues to manipulate the child's surroundings so that highly preferred items are available but not readily accessible. Through careful observation and interaction, the trainer anticipates what the child desires, so as to ensure that a picture of the item is simultaneously available to him or her. At this time, the pictures are usually placed (with adhesive material) upon a board (cardboard, etc.), permitting the child to remove the picture from the communication board and continue to give it to the communicative partner. Alternatively, especially if several children in the classroom are at similar steps in PECS training, the pictures can be attached to containers of items, to shelves, or to other places in the classroom where the child is likely to encounter but not have easy access to desired items.

The first subtle cue to be eliminated is the proximity of the trainer. This goal is accomplished in very small steps. Initially, while the student is reaching toward the trainer, the trainer backs away from him or her so that the student has to stand up in order to reach the adult. As the exchange is completed, the student is reinforced both tangibly (receipt of the item) and socially ("Oh, you want the ball!"). Training is continued in this manner, and the trainer gradually increases his or her distance from the child. Next, the distance between the student and the picture is increased: The trainer systematically begins to arrange for the communication board to be farther away from the child so that by the end of Phase 2, the student is

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able to go to his or her communication board, pull the picture off of it, go to the adult, and release the picture into the adult's hand. The successful completion of this phase of training is often vital if the child is to be a spontaneous communicator.

### Phase 3: Simultaneous Discrimination of Pictures

During Phase 3 the child is taught to discriminate among two or more pictures on the communication board. This training can be accomplished in a variety of ways, depending on the needs of the child. The basic format involves gradually and systematically introducing additional pictures to the communication board. Initially, the trainer sets up situations during which the child is likely to request a particular (specific) object that "fits" the trainer-designed context. With that object in view, and without verbal prompts such as "What do you want?," the communication board is presented with two pictures on it -- one of an object that is contextually appropriate and one of a nonpreferred, or "neutral," object. If the child gives the picture of the available object, the trainer provides that object following the exchange. If the child gives the other picture, the trainer calmly says, "No, we don't have that," and may provide a gestural prompt toward the appropriate picture.

The step is repeated with assistance or anticipatory prompting until the child can respond correctly on 80% of opportunities (see Note 4). An important precaution to take is to rotate the position of pictures on the board so that the child does not learn to request a particular item by using location as the primary discrimination cue on the board (see Note 5). More pictures of desired items are added, so that eventually the child has all of the pictures trained during Phases 1 and 2 on the communication board. New pictures then are added as long as they refer to known reinforcers for the child. Various technical decisions will need to be made at this time, such as whether to reduce the size of the pictures, change the format of the board, and so forth (Ryan, 1990).

For those children who have trouble learning to discriminate among pictures, various back-up steps can be used (Frost & Bondy, 1992). These involve teaching the student to discriminate between a salient picture of the desired item and a blank picture card, a picture of an unknown item, or a picture of a nonpreferred item. Over time, the reinforcement value of the distractor pictures is manipulated so that the child learns to discriminate among pictures of items that are equally desired. A highly structured discrimination training program, often involving "errorless" learning formats, is used when students still have difficulty learning to discriminate (see Sidman & Stoddard, 1967). For children who have difficulty with the symbolic representation of pictures, tangible symbols (Rowland & Schweigert, 1989), such as real or miniature objects or parts of objects, are used followed by a gradual shift to pictures. It is usually not helpful to add trials involving picture-to-picture matching or picture-to-object matching. Such matching tasks do not incorporate communicative intent, nor are they necessary for promoting the exchange of pictures for desired items.

Another aspect of this phase is probing the correspondence between a child's indication of what is wanted via pictures versus what is overtly selected from the set of concrete reinforcing items. This assessment is necessary for ensuring that the student's requests do not become generalized, or "generic," because he or she receives an object that is acceptable (Reichle, Sigafos, & Piche, 1989). This training should begin when the student is reliably discriminating between two or three pictures. The student is presented with two items on a tray, one preferred and one neutral. The communication board is then presented with the two corresponding pictures. Once the student has given a picture, the teacher indicates

that the child can take the appropriate item. If the student selects the appropriate item (i.e., the one that corresponds to the selected picture), the reinforcement follows. However, if the child attempts to take an item that does not correspond with the prior picture selection, the teacher says, "You asked for \_\_\_\_\_," and points to that item. The teacher then gestures to the preferred item and says, "If you want this, then tell me" (and gestures to the appropriate picture). The teacher waits for 5 seconds and repeats the trial. These correspondence checks are repeated periodically throughout the remainder of PECS training.

#### Phase 4: Building Sentence Structure

When children enter this phase of training, their communication systems generally contain 12 to 20 pictures. These pictures have been reduced to a smaller size (3/4- or 1-inch squares) and are organized on a communication board or book. The growing number of pictures are arranged within broad categories to ease retrieval. For example, foods, toys, activities, and personal care needs are separated (and may be color coded). With a single-level communication system, these categories are arranged vertically across several columns or in blocks. Within a communication book, the categories are separated by pages. The student can spontaneously initiate communicative exchanges with several communicative partners regarding a variety of needs or desires.

During Phase 4 the child is taught to request using the phrase "I want \_\_\_\_\_." The rationale for teaching the child to use this structure is twofold (Bondy & Ryan, 1991): First, it is anticipated that the child soon will learn communicative functions other than requesting. Teaching a phrase (or "frame") to use when requesting (i.e., "I want") will provide a differentiated response that clarifies meaning to both the child and a "listener." This function is similar to the impact that intonation has on someone listening to a child who speaks only single words (see Note 6). Second, as will be described later, many of the children taught to use PECS begin speaking at some point during the training. When these children begin to speak, they typically do so using the same structures they have used with the pictures. Teaching the children to request with the picture/card "I want" is a way of increasing the complexity of their communicative exchanges.

The picture exchange is maintained throughout this phase by teaching the child to place pictures on a "sentence strip" to form an appropriate phrase, and to give the entire strip to the communicative partner. The sentence strip is a laminated cardboard strip approximately 4 inches by 1 1/2 inches that is attached with adhesive material to the lower right-hand corner or center of the board. During the initial training in Phase 4, a single picture/card depicting "I want" (not two separate pictures for "I" and "want") is added to the left end of the sentence strip. With the "I want" picture already on the sentence strip, the child is physically guided to place the picture of what is wanted next to the "I want" picture on the sentence strip and to then give the strip to the adult in exchange for the desired item. The child is then taught via backward chaining (see Popovich, 1981) to place both pictures on the sentence strip. The "I want" picture is kept in a fixed location on the communication board, generally in the top left corner. Training continues until the child uses the sentence strip with the full range of available pictures.

Throughout this stage of training, the trainer/teacher should continue to structure the student's regular environment so that numerous opportunities for communicating via picture exchanges are created across the day. He or she should also continue to conduct periodic "correspondence" checks. An added dimension of spontaneous communication involves encouraging the student to request items that are not in sight. Items that are normally in sight are gradually put into

*An added dimension of spontaneous communication involves encouraging the student to request items that are not in sight.*

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containers, into cupboards, and so forth, and situations in which the student is likely to want these items are arranged, so the student learns to request items that she or he knows about but does not see. Thus, the outcome of Phase 4 is that the student requests present and nonpresent items using the phrase "I want." The student continues to locate the communication board, place the appropriate pictures on the sentence strip, approach the adult, and give him or her the sentence strip. At this point the student typically has 20 to 50 pictures on the communication board and is communicating with a variety of partners.

### **Phase 5: Responding to "What do you want?"**

During Phase 5, the child learns to respond to selected verbal prompts. Previously, the child communicated "spontaneously" – each communicative interaction was initiated by the child requesting something from the trainer. In this phase, the child is taught to respond to the direct question "What do you want?" through delayed prompting (Halle, Baer, & Spradlin, 1981). This procedure is designed to provide prompts in such a manner that a successful response is guaranteed for each trial, while simultaneously allowing response independence. Training begins with a desired object present and the "I want" card on the communication board. The teacher simultaneously points to the "I want" card and asks, "What do you want?" The child generally picks up the "I want" picture, puts it on the sentence strip and completes the "sentence" and the exchange. Over time, the interval between asking "What do you want?" and pointing to the "I want" picture is increased by 1/2 to 1 second. As in other cases of delayed prompting, children begin to "beat" the gestural prompt and respond solely to the verbal prompt. The goal of this phase is for the child to respond to "What do you want?" whether or not the object (referent) is present. Opportunities for spontaneous requests must continue to occur so that the child's requests do not become dependent upon his or her being asked a question. By the end of this phase, the child spontaneously requests desired or needed items and actions, and answers the question "What do you want?," throughout all daily activities.

### **Phase 6: Commenting in Response to a Question**

By this time, the child uses the requesting function in a variety of situations and with a variety of people. The purpose of Phase 6 is to teach a new communicative function – labeling, or naming items (see Note 7). This phase begins with objects that the child already can request but that are not the most highly desired. As in Phase 5, the training procedure used is delayed prompting. The trainer places a minimally preferred item on the table, then places a picture/card with "I see" or "I have" or some similar phrase on the communication board along with the referent picture and the sentence strip. While holding up the referent object, the trainer simultaneously asks the child "What do you see?" and points to the "I see" card (see Note 8). If the child does not quickly pick up the "I see" card and place it on the sentence strip, the trainer physically guides him or her to do so. After the card is placed on the strip, the trainer waits 5 seconds to see if the child will place the referent picture on the strip. If the child responds appropriately, the trainer comments "Yes, you see a \_\_\_\_" and gives the child a small reward not associated with what was seen. The "named" item is not given as a reward because receiving that item could confuse the child by signaling that a request had occurred. Using a minimally preferred item (or previously taught conditioned reinforcers) reduces the likelihood that the child will exhibit disruptive behaviors when it is not provided.

As training continues, other pictures/items are added, with the gradual introduction of more strongly preferred items and new items that have not been identified as reinforcers.

After the child is able to answer the question "What do you see?" reliably, the trainer begins randomly asking, "What do you see?" and "What do you want?" The key at this point in training is to reward appropriate answers to "What do you want?" with the item that is requested and to never reward answering "What do you see?" with the item labeled. A correct answer to "What do you see?" (or equivalent forms) is rewarded by an effective reinforcer other than the item labeled (e.g., token-like rewards, praise, etc.). Over time, material reinforcers for "What do you see?" are faded in an effort to assist the behavior being maintained by socially mediated reinforcers. This reduction in concrete-based rewards is important for the continued development of spontaneous labeling or commenting. By the end of this phase of training, these two skills are incorporated into daily activities.

### Beyond Phase 6: Introducing Additional Language Concepts

By the time children have completed the previous phases of training, their vocabulary is associated with a large number of items (30 to 50) that can be requested or labeled. The ongoing goal is to improve the child's functional communicative repertoire by adding various terms to his or her vocabulary (attributes, verb concepts, location concepts, etc.), increasing communicative functions, and teaching a differentiated yes/no response. The vocabulary items are taught by incorporating them into already existing functions; for example, a child is taught to request a *big* cookie, a *red* crayon, a *full* cup, or is taught to comment about his or her own actions as well as those of others in the room (e.g., "I am drinking milk" vs. "John is playing ball").

Once children are able to use their new vocabulary concepts for existing language functions, they are taught to use the concepts in new functions. Such functions include responding to various questions about static, relational, or temporal actions and events; spontaneously commenting; and asking for permission. Children are taught to use these functions in natural settings and during all daily activities, not just during training activities.

An important discrimination for these students to learn to make is responding "yes" or "no" to both "Do you want this?" and "Is this a \_\_\_\_\_?" In many traditional language training programs, responding to each of these questions is considered an equivalent skill. Responding to the former question, however, is a skill that is learned and maintained by non-socially mediated reinforcers (e.g., the receipt or avoidance of a concrete object), and therefore is more likely to be established in the initial communicative repertoires of students with autism. It is not until the student is able to respond to social reinforcement that he or she will learn to respond to reactions to answering the latter question (e.g., "That's right! It is an apple").

Teaching the student to respond to "Is this a \_\_\_\_\_?" must be taught independent of "Do you want?"-type of questions. Furthermore, it is more effective to teach "Do you want?" prior to "Is this a \_\_\_\_\_?" because the consequences associated with the former are direct and not socially mediated. As noted above, it is helpful to begin these lessons with minimally preferred items, to avoid strong emotional reactions when the child does not receive the item involved in the lesson. For example, if the child correctly answers "Yes" to the question "Is this a crayon?" he or she is praised but does not receive the crayon. It should be noted that if socially based rewards are not powerful motivators for a student, then other types of secondary rewards (previously associated with the receipt of concrete

reinforcers) will likely be necessary for the student to learn this skill.

A summary of the sequence of skills acquired within PECS, and the associated teaching strategies for each phase, is provided in Table 2. Within the table are special reminders of aspects that we have found helpful in promoting rapid acquisition of each phase.

### **PECS Outcome: Picture Use and Speech Acquisition**

One important aspect of PECS is the speed at which children acquire functional, spontaneous communication skills (e.g., requesting in the absence of trainer verbal prompts). However, speech is the preferred communicative modality. Within the first few months of our using PECS with young children with autism, we observed several of these children beginning to speak without any direct, formal speech training. Our observations of over 85 students throughout Delaware have indicated that the developing speech of these children tends to follow the content and structure of the picture/cards on their sentence strips. In the following sections, we describe individual and small- and large-group data concerning the acquisition of picture use via PECS and the acquisition of speech by a substantial proportion of these children after a period of time of using PECS.

### **Case Presentation**

Billy (a pseudonym) was 36 months old when he entered DAP. He met DSM-III-R (American Psychiatric Association, 1987) standards for Autistic Disorder. He showed little interest in people and preferred to remain alone, playing with inanimate objects. He was ritualistic in his patterns of play, and most of his play skills were idiosyncratic and largely nonfunctional. He displayed no speech or systematic communicative intent, as confirmed by a speech/language pathologist, psychologist, and teacher. He made only fleeting eye contact and he seemed to actively avoid it when someone spoke in a direct fashion to him. He liked snack foods, as indicated by his persistent consumption of pretzels, potato chips, and so forth when these were made freely available.

Billy was taught the first phase of PECS on his first day in DAP. His first requests were for pretzels. Teaching Billy to pick up a picture of a pretzel from the tabletop and put it into the open hand of the teacher sitting next to him took 10 trials. Staff gradually moved away from Billy when he picked up the picture of the pretzel, and eliminated their open-hand cue. For the next several days, staff left the pretzel picture in various open parts of the room and always had pretzels with them. Each time Billy gave the picture to a staff member, they immediately gave him a small piece of pretzel and commented "Oh, you want a pretzel!" (or some equivalent statement). Over the next few weeks, additional single pictures and their corresponding rewards were successfully presented to Billy. Within 1 month, he could ask for eight different types of reinforcers. During his third week in DAP, staff began to require Billy to make a choice between two pictures. Over the next month, additional requests were added to the system, each of which he was capable of selecting when presented multiple pictures. By the end of the second month, Billy used the "I want" card with the picture of the item desired and used the sentence strip to make his requests. It was during the third and fourth months that Billy learned to use the "I see" card in response to "What do you see?" and to use the "I want" card when asked "What do you want?" By the end of the fourth

**TABLE 2**  
**PECS Training: Skills, Corresponding Teaching Procedures, and Special Considerations**

Phase	What is taught	Teaching procedures	Special considerations
1	Requesting via picture exchange	Fading of physical prompts with backward chaining; repeated discrete trials; incidental training	No verbal prompts used -- only attentional signals; use a variety of trainers; conduct periodic reinforcer assessments
2	Increased spontaneity -- moving to trainer and to picturebook	Shaping; repeated discrete trials; incidental training	No verbal prompts used; use a variety of trainers; conduct periodic reinforcer assessments
3	Discrimination of pictures from which requests are made	Discrimination training; anticipatory prompting; repeated discrete trials; incidental training	Probe discrimination skills before beginning; conduct correspondence checks; conduct periodic reinforcer assessments
4	Requesting with a phrase	Backward chaining; repeated discrete trials; incidental training	No verbal prompts used; continue correspondence checks; conduct periodic reinforcer assessments
5	Answering "What do you want?"	Delayed prompting; repeated discrete trials; incidental training	Provide opportunities for spontaneous requesting; conduct periodic reinforcer assessments
6	Commenting in response to a question	Delayed prompting; discrimination training; repeated discrete trials; incidental training	Reinforce requests and comments appropriately; conduct periodic reinforcer assessments
Post-PECS training	New vocabulary concepts; spontaneous comments; "yes/no" question discrimination		

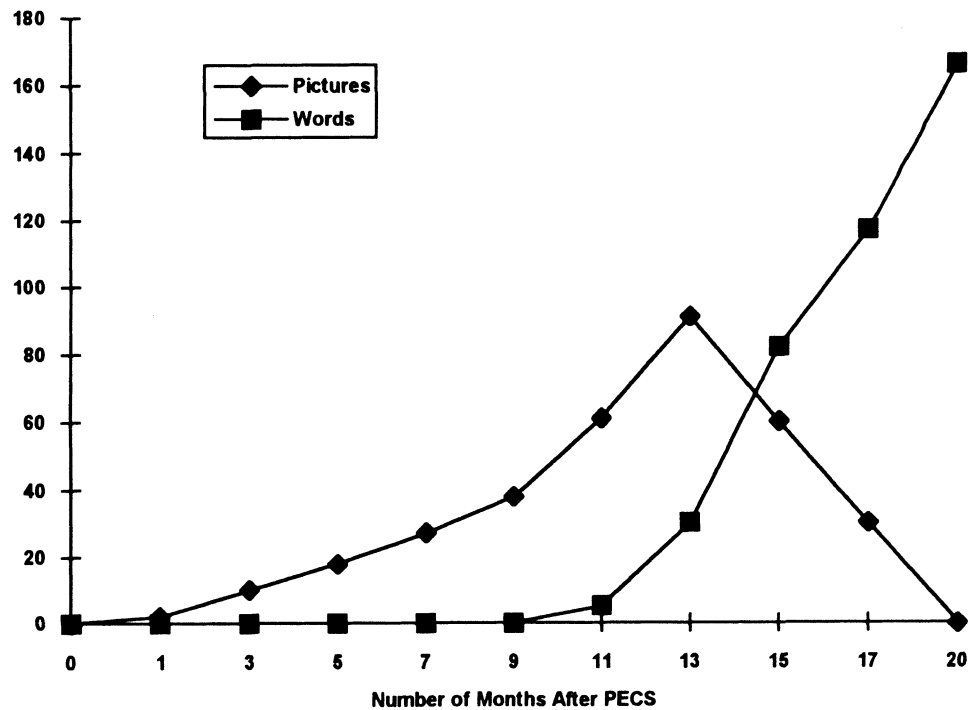
month, Billy was using speech while moving each picture onto the sentence strip (see Figure 1); however, his speech was not clear enough to be effective with strangers. Over the next few months, his picture repertoire grew to over 100 pictures (see Note 9), including various attributes and adjectives, verbs, nouns, and other verbal functions. The intelligibility of his speech gradually improved as he spoke while manipulating each picture within the sentence strip format. Staff gradually removed pictures of the strongest spoken words, and after 11 months he used only speech to communicate.

The form and sequence of Billy's progress in PECS is typical of most children in this group. Children typically progress through Phases 1 and 2 within a matter of days (Phase 1 has been mastered by many children in as few as six trials). Phase 3 training ordinarily lasts the longest for all students, but it progresses more rapidly for those students who, prior to PECS training, showed some interest in pictures. Actual time spent in Phase 3 training is extremely variable, ranging from several days to several months. Issues generally related to the acquisition of complex visual discrimination are involved with the rapid acquisition of this phase of training. Phases 4 and 5 usually are mastered within a few weeks. Although there are differences in the rates of phase and with regard to the development of speech, virtually all children who have developed speech displayed a period during which their use of pictures served as their only effective communication modality.

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## Small Group Outcome on Picture Versus Speech Acquisition

Like Billy, many other children have developed speech through PECS training. Bondy (1989) reviewed the progress of seven children with autism who displayed acquisition patterns resembling Billy's. The principal pattern was (a) initial observation confirming the absence of speech or other functional communication skills, (b) rapid development of picture use via PECS, (c) gradual development of speech during a period of mixed speech and picture use, and (d) total use of speech without any augmentation by pictures. The children's mean age upon entry was 3 1/2 years (see Table 3). They averaged fewer than 2 weeks to acquire their first picture, and the average time to acquire their first 10 pictures was 3 months. The average number of months to the time of their first spoken word was 5.4, while the average number of months until they acquired 10 spoken words was 7.1. The average number of pictures used by the time their spoken word repertoires matched their picture repertoires was 71.3, and the average time to this point was 11.3 months. These children had been functional communicators several months before they acquired reasonable spoken repertoires. Furthermore, for each of these children (who had started their educational placement without functional speech), speech was the dominant communication modality in less than 22 months, and in as few as 5 months.



Age at Start = 3 years 0 months

**Figure 1.** Number of pictures and number of spoken words used by Billy following introduction of PECS.

### Total Outcome for PECS

Over the past 5 years, we have followed 85 children who were taught to communicate with PECS as their initial communicative modality. Each of these children entered training without functional speech or alternative communication systems, as identified during their intake assessment by a team consisting of a speech/language pathologist, a psychologist, and a teacher. This group of children did not include those preschoolers who displayed some functional speech (even if their speech also included a variety of communication difficulties, such as echolalia, perseveration, or similar functional problems; see Note 10). These were children with essentially no socially acceptable system of communication. Although exact information regarding intellectual functioning was not available for the children upon their entry into DAP, their intellectual functioning levels ranged from near normal to profoundly retarded. All children in this group were 5 years old or younger when started on PECS. They were all educationally classified as autistic and lived with their parents or guardians. Over 95% learned to use two or more pictures within the exchange format. Almost all learned at least one picture within 1 month of starting the system.

*Overall, 76% of all the children placed on PECS have come to use speech either as their sole communication system or augmented by a picture-based system.*

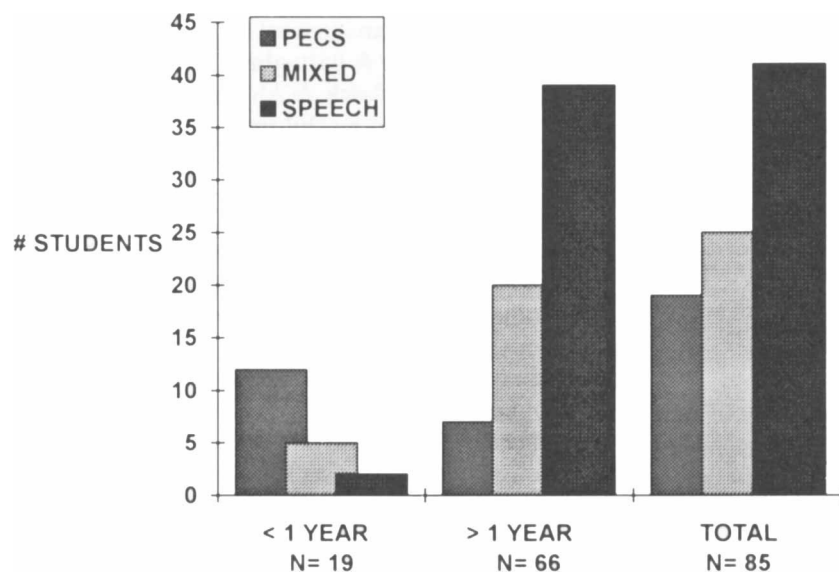
For the 66 children who used PECS for more than 1 year (Bondy & Peterson, 1990), 39 (59%) acquired speech as their sole communication system (see Figure 2). Of the total group (i.e., children using PECS for more than 1 month), 25 (29%) currently use a combination of speech and pictures or use a complex printed word system, while 41 (48%) use solely speech. Twenty of the children in the mixed-outcome group have spent less than 2 years within DAP. Overall, 76% of all the children placed on PECS have come to use speech either as their sole communication system or augmented by a picture-based system. Even within 1 year of starting on PECS, 2 of the 19 most recently identified students already used speech as their sole communication modality. The large majority of the children who continue to rely on PECS as their sole means of communication function in the profoundly handicapped range of intellectual abilities.

The changes in communication skills also have been associated with changes in behavior management targets and various idiosyncrasies associated with autism (Bondy & Battaglini, 1992). For example, the Autism Behavior Checklist (ABC) (Krug, Arick, & Almond, 1980) provides a list of various unusual behaviors often displayed by children with autism. The higher the score on this checklist, the greater the number of unusual or problematic behaviors reported for a child. We compared the ABC scores of 41 children started on PECS with the communication modality they used after several years in school (Bondy & Frost, in press). The three outcome groups (i.e., using solely speech, using solely a picture system, or mixed use of both pictures and speech) had comparable ABC scores upon entry into PECS training (see Figure 3). After a year or more on PECS, children who remained on a picture-based communication system and had not developed speech, demonstrated a small reduction in their ABC scores. Children who spoke but continued to use a picture system demonstrated a modest reduction. Finally, those children who developed speech as their sole communication modality following training on PECS demonstrated substantial reductions in their ABC scores. Although studies have demonstrated that training in "functional communication" (generally narrowly defined) is instrumental in fostering a reduction in specific behavior management targets (for a review, see Doss & Reichle, 1989), the type of outcome described here provides only correlational, not causal, support for the relationship between language development and frequency of behavior management targets. More controlled studies are needed to demonstrate the long-term benefits of rapidly acquired communication systems with very young chil-

**TABLE 3**  
**Results for Seven Students Started on PECS**

Category	Result
Mean age at entry	3 years 6 months
Mean time to first picture	3 days
Mean time to first 10 pictures	3.0 months
Mean time to first spoken word	5.4 months
Mean time to first 10 spoken words	7.1 months
Mean time to X	11.3 months
Mean number of pictures at X	71.3
Mean age at X	4 years 5 months

*Note.* X = point in time when the number of pictures equals the number of spoken words.



**Figure 2.** Outcome communication modality for students by how long they have been using PECS. (*Speech* refers to the sole use of speech, *mixed* refers to spoken words augmented by a picture/symbol system, and *PECS* refers to the student continuing to use only pictures to communicate.)

dren with autism who display a number of behavior management targets.

### Conclusion

The Picture Exchange Communication System is an initial language training package that is helpful with very young children who display significant communication deficits. We have described the theoretical and practical advantages of early training on PECS as compared with other communication modalities. The system does not require lengthy training of repertoires maintained by artificially arranged consequences. Rather, it begins with the recognition of what the child currently seeks in the real world. PECS promotes communication in a social exchange during which the child initiates the interaction.

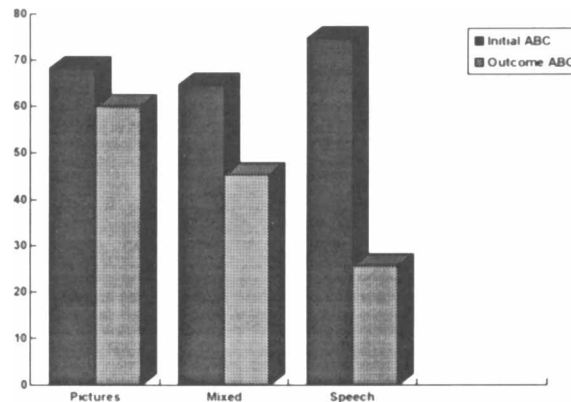
The importance of establishing initiation along with social approach cannot be overemphasized. The history of autism is replete with commentaries about the lack of spontaneous communication following language intervention programs (see Carr, 1982; Reichle & Sigafos, 1991; Reichle, York, & Eynon, 1989). However, a large proportion of the difficulty displayed may be due to the type of intervention training. For example, in one textbook espousing a functional approach to communication interventions, the authors (Reichle et al., 1991) describe teaching "requesting" before the chapter describing issues pertaining to establishing spontaneity. However, in their chapter regarding requesting (Reichle & Sigafos, 1991), part of the "prototypic requesting sequence" (p. 95) includes, under the stimulus conditions, that the trainer "may also ask, 'What do you want?' " (p. 95), thus undermining spontaneity. The inclusion of this type of verbal prompt early in training often requires difficult subsequent intervention strategies designed to remove or reduce the effects of such prompts. PECS builds initiation (i.e., spontaneity) into the first step of training.

Although PECS was developed with children with autism, it has been used successfully with children with other handicaps, as well (Bondy & Frost, 1993). Many children with handicaps, although responsive to socially mediated reinforcement, do not adequately learn the social-interaction aspect of communication (Frost & Bondy, 1992). Furthermore, these children may be more motivated to respond to teaching efforts that involve receiving concrete rewards they have already indicated an interest in.

One concern of some professionals and parents of very young children with communication handicaps is the perceived risk associated with emphasizing a nonvocal training sequence as the first communicative strategy and its potential for reducing the likelihood of speech development. We agree that the long-term goal of communication training is the development of speech. However, it is not appropriate to compare a 2- or 3-year-old child who has not developed functional speech with a younger speech-free child who has demonstrated typical patterns of development. Furthermore, an estimated 50% of all children with autism do not develop functional speech (Frankel, Leary, & Kilman, 1987). Given that 20% of such children entering DAP display some functional speech and that, via PECS, at least three quarters of the remainder come to acquire speech, a total of 80% of the children entering DAP acquire functional speech. This dramatic improvement over the cited base rate is, in our opinion, largely attributable to the use of PECS with these very young children. Controlled group studies are needed to affirm this viewpoint.

A variety of behaviors (sometimes identified as "prelinguistic") do not seem to develop normally in children with autism or similar handicaps (e.g., eye contact, appropriate facial expressions, voice intonation, etc.). We believe it is critical to rapidly establish the essence of communication for a child, namely, approaching a

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**Figure 3.** Initial and outcome ABC scores (Krug et al., 1980) by communication modality outcomes for 41 students. (*Speech* refers to use of speech alone, *mixed* refers to speech augmented by pictures, and *pictures* refers to use of pictures alone.)

communicative partner and interacting in a manner that effectively results in that partner's doing something for the child. The 2- or 3-year-old child with autism does not have a successful history of using vocal behavior in this manner.

Our description of PECS in this article has focused on its use with preschool children. We also have introduced this system to adolescents and adults. Our results (see Bondy & Frost, 1993), and results reported to us, have indicated the rapid acquisition of Phases 1 and 2. The principal factors associated with acquisition of the more complex phases appear to be those related to general intellectual functioning, as opposed to other behavior characteristics associated with autism. We are aware of several examples of the introduction of PECS with adults wherein staff reported these individuals' first independent communication responses ever. We also have introduced PECS to adolescents who had been taught other nonvocal communication modalities, such as sign language. In general, these were adolescents who were not acquiring new signs and thus had fixed repertoires, often from 20 to 50 signs. The replacement of the sign repertoire by PECS took no more than 6 months, and they continued to acquire new pictures beyond the size of their initial sign repertoires. These gains were most conspicuous in the areas of vocational and community settings.

In our experience, we have not seen a general relationship between the acquisition of PECS and the development of speech in children or adults older than 7 years. We did observe one case (in the Ann Sullivan Center in Lima, Peru) of a 15-year-old adolescent who began to talk for the first time in his life after advancing to Phase 5 of PECS. Unfortunately, we do not have systematic data at this point on the relationship between acquiring skills with PECS and the development of speech in children older than 7 years.

PECS involves concrete objects and pictures, and has a direct impact upon the communicative partner. Furthermore, PECS does not require prerequisite imitation skills, facial orientation, or motor skills not currently in the child's repertoire, and thus avoids the lengthy training history necessary for the initial establishment of such repertoires. Finally, on an empirical level, as evidenced by the large proportion of children who have started on PECS and gone on to develop functional speech, the initial use of this picture-based modality does not hinder the use of the speech apparatus nor delay the development of functional speech. Further study in this area is clearly called for. Other questions involve the best prognostic indicators for the use of this system versus other communication systems.

## Authors' Note

*We wish to thank the staff of the Delaware Autistic Program for their efforts in the development and implementation of PECS over the past several years, especially Cindy Finnegan and Sally Wemmers. We also wish to thank Nancy Neef for her helpful comments on an earlier draft of this article. Finally, we express our appreciation to the Christina School District and the State of Delaware for their continued support of the Delaware Autistic Program.*

## Notes

1. *We have often found it helpful to have two trainers involved in these initial trials -- one to attract the child to the desired object (and then give it to the child) and the other (from behind the child) to promote picking up and handing the card to the other trainer.*
2. *The type of representational symbols used within PECS is individualized to meet the varying needs and abilities of the children. In general, children use pictographic line drawings that are available commercially. (For a review of these symbols, see Reichle, York, and Sigafos, 1991.) Sometimes these drawings are color-enhanced. If a child's particular preferences are not available via commercial picture collections, a photograph or hand-drawn picture can be used. Some children use product logos or manufacturer pictures, such as those on toy boxes or in toy catalogs. During the initial stages of training, the pictures are the larger (generally 2-inch square) pictures from the commercial sets. These picture-cards also may contain printed words corresponding to the accompanying picture, although this is not a necessity.*
3. *During later phases of training, the child can be taught to respond to cues such as "It's not time for that," or "We don't have any of that now." All children eventually must learn to deal with delayed receipt of desired items.*
4. *Anticipatory prompting is used when a pattern of errors has been observed during a period of training. During a teaching situation in which an error is anticipated, the teacher gestures to the correct response choice (in this case, a picture) before the error has taken place. Over trials, the anticipatory prompt is faded in time or intensity (cf. Bondy, 1990).*
5. *If there is good reason to believe that a child is very unlikely to learn more than three or four pictures over a long period of time, fixed positioning may be appropriate.*
6. *Intonation helps the listener understand something about the speaker, rather than something more about the "content" or referent of the message. For example, a young child may say "cookie?" vs. "cookie!" and we signify the different intonation (and thus meaning) by using different punctuation marks when we write. In Skinner's (1957) terminology, this verbal function is called "autoclitic."*
7. *A more complete analysis of the types of verbal functions taught during the early phases of PECS is offered by Skinner (1957). The requesting taught during the initial phases are "mands," while the labeling taught during this phase are "tacts." These tacts are "impure" in that they are partially under intraverbal control (i.e., the trainer's preceding question). This detailed analysis has been an important guide to the development of the training sequence of PECS and other aspects of verbal training (Bondy & Frost, 1992).*
8. *To promote the rapid acquisition of diverse "frames" that will accompany and distinguish between requests and labeling, we recommend using a variety of frames and related questions (i.e., "What do you see?" "What do you hear?" "What's there?" "What do you have?" etc.) early in training.*
9. *Data on picture and speech repertoires were collected by teachers and speech/language pathologists. For a response to be included in the database, at least two staff members needed to report at least two separate successful uses of the picture or spoken word.*
10. *We have used PECS with children who display echolalia but only limited functional speech. The introduction of PECS with these students has been successful in increasing their use of functional speech. However, these children were not included in the group described.*

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