The Effectiveness of the Picture Exchange Communication System (PECS) in autism

Rejani Thudalikunnil Gopalan¹ & Ellen Tiong Piking²
¹Gujarat Forensic Sciences University
²University Malaysia Sabah

Abstract: The purpose of this study was to determine the effectiveness of the use of the Picture Exchange Communication System (PECS) on the improvement of functional communication skills among children with autism. Method: Case study design with pre and post assessment was used. A four year old child diagnosed to have autism was participated in the study. In the study only two of the six PECS phases (the Physical Exchange and Distance and Persistence) were selected to teach the child because of lack of language ability. Result: The data from this study indicates that in terms of the PECS acquisition data in phase 1 and 2, and the PECS did improve the participant’s functional communication skills, especially the ability to request edibles, toys or activities, given choice and greeting. Conclusion: A visual inspection of the data collected revealed that overall the participant in the study had improved some functional communication skills that would allow him to appropriately communicate his basic wants and needs which indicate that PECS is effective.

Key words: Picture Exchange Communication System (PECS), Autism, functional communication skill

Introduction & Review

Studies have indicated that the prevalence of autism may be as high as 1% (Baird et al., 2006) and many children with autism are facing with communication difficulties. One-third to one-half of children and adults with autism do not have functional speech (Mirenda, 2003). Functional Communication is a communication that occurs in response to natural cues and contingencies within the everyday environment. They may show only pre-intentional communication such as reaching for a desired item or communication may through behaviors such as alternating eye gaze and conventional gestures such as pointing (Yoder et al., 2001). Besides that, individuals with serious developmental disabilities other than autism may also fail to develop speech and language skills (Westling & Fox, 2004). Hence, in order to help to develop communication skills, various of augmentative and alternative communication (AAC) have been developed. For example, manual signs (Layton, 1988; Yoder & Layton, 1988), and voice output communication devices (VOCAs) (Lancioni et al., 2001). Unfortunately, instructional strategies using AAC systems which rely on the overuse of verbal or physical prompt may bring result of some children become prompt dependent and lack spontaneity in their communication (Mirenda & Dattilo, 1987).

However, a promising instructional interventional with AAC is the Picture Exchange Communication System (PECS) which developed by Frost and Bondy in 1994 to help children with autism acquire functional communication skills. PECS is widely used among individuals with autism. It developed in 1985 by Lori Frost, a speech pathologist, and Andrew Bondy, a behavior analyst. According to Frost and Bondy (2002), PECS is an augmentative alternative communication system (AAC) that teaches children and adults with autism and other communication deficits to initiate communication. PECS training protocol is based on applied behavior analysis (ABA) techniques, whereby functional communication is systematically taught using prompting and reinforcement strategies that lead to independent communication. Besides that, PECS also teaches discrimination of symbols and then sequencing to create simple sentences. In the most advanced phases, individuals are taught to comment and answer direct questions. There are six phases in the PECS which are Physical Exchange, Expanding Spontaneity, Picture Discrimination, Sentence Structure, Responding to “What do you want?”, and Commenting. The criterion for successful completion of each phase was 80% unprompted successful trials in a 10 trial block.

PECS appears promising for several reasons. First, PECS avoids difficulties inherent in other systems by requiring very few prerequisites. In fact the only prerequisite is that the individual can clearly indicate such as by reaching for an item of what he or she wants, in a way that can be shaped into exchanging a physical symbol such as a picture
(Frost & Bondy, 2002). Second, the first skill taught in PECS is requesting. Requesting has often been targeted in early instruction of individuals with developmental disabilities due to motivational considerations (Reichle & Sigafos, 1991). Third, PECS systematically addresses the issue of spontaneity which has often been reported as problematic in individuals with autism spectrum disorders (Chiang & Carter, 2008). Fourth, picture symbols can be highly iconic, closely resembling their referents (Ganz & Simpson, 2004; Mirenda, 2003). As a result, they may be easily recognized by the learner (Ganz & Simpson, 2004) and are more recognizable by communicative partners than other systems such as manual signs (Lancioni et al., 2007).

According to the PECS manual, PECS has six phases. At phase 1, child is taught to make exchange with a wide variety of single line drawings; at phase 2 child is taught to generalize the picture exchange across a variety of trainers and further distances; at phase 3 child is taught to discriminate among several drawings and corresponding pictures with preferred items; at phase 4 child is taught to make requests in the form of sentences; at phase 5 child is taught to answer a variety of questions, including “What do you want?”; and last at phase 6 child is taught to expand on previous skills.

PECS uses basic behavioral principles and techniques such as shaping, differential reinforcement and transfer of stimulus control via delay to teach children functional using pictures as the communicative referent. The pictures are kept by the child on a notebook (PECS board). Also, the child is taught to use his or her PECS board and create a “sentence” by selecting picture cards such as “I want” card plus “juice” card and delivering the cards to a communicative partner as a request for a desired item. In addition, PECS emphasizes teaching a child to initiate requests, respond to questions such as “What do you want?” and make social comments such as “I see a ball [object]”.

A multiple baseline design was used by Charlop-Christy et al. (2002) to examine the effects of Picture Exchange Communication System (PECS) training on multiple outcome measures related to the acquisition of communication skills, emergence of speech, social-communicative behaviors, and problem behaviors with the three boys with autism ages 3, 5 and 12. The result indicated that in addition to learning PECS, all children showed an increase in verbal speech, increase in social-communicative behaviors and decreases in problem behaviors. Webb (2000) reported communication gains in 6 children with autism ages 4 to 6. After 6 months of Picture Exchange Communication System (PECS) training, these children not only used hundreds of PECS pictures but also increased in spoken language from a baseline average of 10 words to a follow-up average of 68 words. PECS is found to be effective for improving spontaneous language including use of the icons and verbalizations and prosocial skills (Kravits et al. 2002; Malandradi and Okalidou, 2007; Ganz et al. 2008), and general level of communication and adaptive behavior (Maggiati and Howlin, 2003; Marckel et al. 2006; Howlin et al. 2007).

Though studies have reported effectiveness of PECS, it requires more researches to ascertain its effectiveness; hence this study is conducted to find its impact on functional communication in Autism.

METHOD
Objective
The purpose of this study was to determine the effectiveness of the use of the Picture Exchange Communication System (PECS) on the improvement of functional communication skills of a child with autism.

Research Design
Research design was case study method with pre and post assessment.

Participant
The participant of this study was a 4 years old boy with autism. Both parents are working and he has a younger brother aged 2 years old. His parents note that he did not crawl but started “bum walking” to get around when he was 8 months old and he began walking when he was 15 months. When the participant was 2 years old, his parents found that his characteristic behaviors were different with other children such as non-speech vocalizations, lack of eye contact, whining, flapping hands and lack of response to people. The participant was referred for an assessment by the Paediatric Neurologist at a Hospital as there was concern regarding his speech and language development and he was referred for speech therapy.

Location
The study was conducted in a special school, Kota Kinabalu, Sabah.

Tool that used for pre and post assessment
1. An Informal Preference Assessment tool (O’Brien & O’Brien, 2002) which used to provide the richest information about what is motivating to individual participants and family members and those who work closely with the child
were interviewed. A series of detailed questions was used to understand what activities, items, people and foods were considered to be child preference. Besides that, observing the child within his natural routines also offered some informal assessment of what the child found enjoyable and was incorporated into the study.

2. The Initial Functional Communication Skills form assess a participant’s Initial functional communication skills upon entering a program. The form lists functional communication skills such as; types of skills to request, protest/reject, affirm/accept, and skills to make greetings and comment. The target priority is rated as N= NO, Y= Yes and E= Emerging. The same too was used for post assessment of functional communication skills.

3. Picture Exchange Communication System (PECS) data sheets which consisted Phase I: Learning to Communicate Coding Sheet and Phase II: Distance & Persistence Coding Sheet. These forms were developed by the Pyramid Educational Products, Inc (2001). The form lists Phase 1: Learning to Communicate such as; Trial, Pick-Up, Reach, Release, Object Cue and Activity. Meanwhile the form lists Phase 2 such as; Trial, Travel to Trainer, distance to Trainer, Auditory cues from trainer, Object Cue and Activity. The target priority is rated as Code (+) for Independent, FP = Full Physical Prompt, and PP = Partial Physical Prompt.

Procedure
After getting consent from parents, pre-assessment was carried with an Informal Preference Assessment tool and Initial Functional Communication Skills. Then Picture Exchange Communication System (PECS) training was started, daily sessions were given lasted up to 1 hour for 10 days. A trial was defined as beginning when the communicative partner began enticing participant with a preferred item such as holding a toy within three feet and within participant’s sight or when participant spontaneously took a picture out of the communication book, touched a box containing a preferred item, or picked up the box to make a request. In addition, the trial ended five seconds after participant completed the exchange.

The researcher intended to teach participant to use PECS following the PECS protocol as stated in the manual (Frost & Bondy, 2002). Participant training included reinforcer assessment, baseline and two training phases which were Phase 1: Physically exchange, and Phase 2: Expanding spontaneity.

The Picture Exchange Communication System (PECS) Acquisition in Each Phase

Phase I: The physical exchange (learning to communicate). This phase was lasted 5 days. At the first structured training session of this phase, the participant requires partial physical prompt for all three steps (pick-up, reach and release) in the exchange sequence during the first four trials. The trainer (communicative Partner) diminished partial physical prompt at Trial 5. At trial 6, the trainer started using different reinforcers to prevent the participant from getting tired of the same reinforce. The same situation was continued for two days (Sessions 1 and 2). From Session 3, the participant no longer needed partial physical prompt and was able to spontaneously produce correct exchange behaviors. At Session 4 and 5, the participant was 100% correct rate in the last structure training sessions. The trainer then moved on to Phase II.

Phase II: Distance and persistence. This phase was lasted 5 days. At the first session of this phase, the trainer (communicative partner) moved the participant’s book around one foot away from him. By the end of the session, the participant was able to walk two feet to get the picture on his communication book and then four feet to get to the trainer. At the second session, the participant was able to get the picture to exchange different reinforcers with different communicative partner (the trainer and trainer’s friend) from 4 feet. However at the third session, the participant again required assistance to travel to the trainer, so the trainer move the book back closer to the participant. To build a firm basis for this phase, the trainer kept distance for another session. At session 4, the participant again showed more independence at traveling to the trainer. Therefore, the trainer again increased the distance from two feet to five feet to the book. By the end of the last session of this phase, the participant was able to walk from five feet to reach the trainer without prompts from the physical prompter and went to get the picture when it was not directly in front of him.

Result
The Pretest and Posttest of Functional Communication Skills
As shown in Table 1, the pretest and posttest results for the Initial Functional Communication Skills were presented in requesting skills, protest or rejecting skills, affirm or accept skills, greeting skills and commenting skills.
Requesting skills: During pretesting, when an adult or the tutor showed edibles, toys, or activities, the participant was unable to attempt at times to respond verbally as if to request one of the items shown by either saying “please” or “more”. The participant did respond to the presentation of items by inappropriately reaching for or grabbing at the items presented. In addition, when help or assistance was needed, the participant possesses the functional communication skills to request help or assistance from an adult. For example, the participant would pull the tutor or adult’s shirt, use hand leading or gesture to ask for help or assistance. The same was also found when the participant was given a choice between items such edibles, toys or specific activities, he was unable to appropriate request a specific item or activity (see Table 1).

At the time of post testing, the participant was able to request either an edible or toys using the Pictures Exchange Communication System (PECS). For example, when he wants to play the bubbles, he would get the picture from the communication book and give the picture to the tutor or adult. However, the participant was still receiving training on using the PECS to request help appropriately because he was unable to use PECS or the “help” sign to request help. Meanwhile to request items or activities when given a choice, the participant was able to use PECS to request specific items or activities appropriately.

Protest or rejection skills: During pretesting, when an adult or tutor shown an item or activity that the participant did not like or want, he was able to sometimes appropriately respond in protest by shaking his head “no”. But, sometimes the participant would show other inappropriate responses too, such as pushing the item away or moving away from the activity and also he would cry or whine when the teacher or adult force him to do the activity (see Table 1).

At the time of post testing, sometimes the participant was able to appropriately reject items or activities by shaking his head “no” and push item away. Meanwhile, he was still continued to whine or push items away to inappropriately communicate protest or rejection.

Affirm or accept skills: During pretesting, when the tutor or adult shown an item or activity that the participant liked or wanted and asked “DO you want this?”, the participant did reach or grab at items that he wanted. Also, he would cry and whine when the tutor or adult does not want to give the item or activity that he liked (See table 1).

At the time of post testing, the participant was able to appropriate accept or affirm items or activities by nodding his head “yes” and at the same time he would also inconsistently used the PECS to respond “yes”.

Greeting skills: During pretesting, when the participant greeted by an adult or the tutor, he was unable to respond verbally or use hand gesture in greeting “hi” or “bye” while he was just staring at the tutor or an adult when his or her greets to him (see Table 1).

At the time of post testing, the participant could respond to a greeting consistently. He could give a hand shake or high five when an adult or the tutor shown his or her palms up to request handshakes or high five. On the other hand, the participant could respond with a hug when an adult or tutor shown hug gesture to him.

Commenting skills: During pre-testing, the participant was unable to comment either verbally or in gesture on items, activities, or his internal state (see Table 1). At the time of post testing, the participant was not ready for this type of training.

To sum up, after receiving training in the Picture Exchange Communication System (PECS), the participant in this study showed some type of improvement in his functional communication skills during the post testing. The participant acquired the ability to request edibles, toys or activities and was ability to use the PECS to make choice when offered edibles, toys or specific activities. In addition, when the tutor or adult offered items or activities, the participant has learned to appropriately reject or accept these items or activities by shaking or nodding his head “No” or “yes”. Upon being greeted by an adult or the tutor, the participant was able to respond appropriate in some way such as when the tutor or adult showed his or her hands up and say ‘high five’; the participant could give respond to the tutor or adult.

Overall, the participant had improved some functional communication skills that would allow him to appropriately communicate his basic want and need.

DISCUSSION
This study was carried out mainly to determine the effectiveness of the use of the Picture Exchange Communication System (PECS) on the improvement of functional communication skills in a 3 years 11 months old boy with autism. The data
from this study indicates that in terms of the PECS acquisition data in phase 1 and 2, and the PECS did improve the participant’s functional communication skills, especially the ability to request edibles, toys or activities, given choice and greeting.

There is a lot of evidence supporting the effectiveness of PECS. In a study by Schwartz, Garfinkle and Bauer (1998), they found that 31 children of various significant disabilities progressed from having limited functional communication skills to using PECS to communicate with adults and peers. Marckel, Neef and Ferreri (2006) study attempted to teach two young boys with autism to use descriptors such as functions, colors or shapes to request then unavailable item; over 40 sessions, both children were able to successfully improvise with PECS to request the desired items. Malandraki and Okalidou (2007) study involved the use of PECS to develop functional communication skills in one autistic boy and profound hearing loss; over the four-month study period, the participant learned to use PECs to communicate spontaneously and also develop prosocial skills.

CONCLUSION
The aim of the study was to find the efficacy of Picture Exchange Communication System (PECS) on the improvement of functional communication skills of a child with autism and result showed that the participant was able to request or make his want and need known in a more appropriate manner. His functional communication skills improved in that he could use single pictures to appropriately communicate to the adults which indicated that PECS was effective.

Limitation of the study
Although the PECS use was successful for the participant in a school setting, it is not certain that whether or not the participant would exhibit similar performance in other setting. The researcher did not complete all six phases of the PECS while only two phases of PECS were chosen to teach the participant. An intervention across all phases of the PECS for the participant might have produced different results.

suggestions for future studies
A larger sample size with longer duration of treatment would offer the opportunity to obtain more reliable results if this study were to be replicated. Further research could investigate the benefits of PECS with more individuals with multiple disabilities.


### Table 1: Pre and Post Test Results for Assessment of Functional Communication Skills

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Skill</td>
<td>Pretest</td>
<td>Posttest</td>
</tr>
<tr>
<td>2</td>
<td>Request-edibles</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>3</td>
<td>Request-toys</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>4</td>
<td>Request-activities</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>5</td>
<td>Request-help/assistance</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>6</td>
<td>Request-social routine</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>7</td>
<td>Request-given choice</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>8</td>
<td>Request-item for task</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>9</td>
<td>Request-additional work</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>10</td>
<td>Request-break</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>11</td>
<td>Request-information</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>12</td>
<td>Request-clarification</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>13</td>
<td>Request-permission</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Protest/reject-item</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>16</td>
<td>Protest/reject-activity</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Affirm/accept</td>
<td>N</td>
<td>E</td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Greetings-respond</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>21</td>
<td>Greetings-initiate</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Comment-on items</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>24</td>
<td>Comment-on activities</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>25</td>
<td>Comment-on internal state</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>