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The Effect of the PECS Alternative Communication System on Vocal Speech Acquisition in Children with Autism

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This article describes the positive effect of teaching the PECS (Picture exchange communication system) alternative communication system on vocal speech acquisition in children with autism spectrum disorders (ASD). Materials from an empirical study of three children with ASD and other mental disorders aged 2–4 years are presented. Measurements were made of the number of communication initiatives in children, in the form of requests using PECS pictures for three months. As a result of teaching communication using the PECS system, two out of three children had vocalization responses, in the form of words and phrasal speech. All three children demonstrated a decrease in the number of challenging behavior episodes as they learned functional communication. It was found out that learning to ask with the help of PECS has a positive effect on the vocalizations in children with autism and other mental disorders. Children trained to communicate using the PECS alternative communication system demonstrate less challenging behavior, acquire functional communication skills, which, in general, improves the quality of life of the child’s family.

Keywords: PECS alternative communication system, verbal behavior, functional communication, alternative communication, augmentative communication, autism spectrum disorders, applied behavior analysis, teaching communication skills.

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Влияние системы альтернативной коммуникации PECS на проявления вокальной речи у детей с аутизмом

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Показано положительное влияние обучения системе альтернативной коммуникации с помощью обмена изображениями PECS (Picture exchange communication system) на проявления вокальной речи у детей с расстройствами аутистического спектра (РАС). Представлены материалы эмпирического исследования троих детей с РАС и другими ментальными нарушениями в возрасте 2–4 лет. В течение трех месяцев проводились замеры количества коммуникативных инициатив у детей в виде просьб с помощью карточек PECS. В результате обучения общению с помощью системы PECS у двоих детей из троих появились вокальные речевые реакции в виде слов и фразовой речи. У всех троих детей произошло уменьшение количества эпизодов нежелательного поведения по мере обучения функциональной коммуникации. Выяснено: обучение просьбам с помощью PECS позитивно влияет на проявления вокальной речи у детей с аутизмом и с другими ментальными нарушениями. Дети, обученные общению с помощью системы альтернативной коммуникации PECS, реже демонстрируют нежелательное поведение, приобретают функциональные коммуникативные навыки, что в целом улучшает качество жизни семьи и ребенка.

Ключевые слова: система альтернативной коммуникации PECS, расстройства аутистического спектра, прикладной анализ поведения, обучение коммуникативным навыкам, функциональная коммуникация, альтернативная коммуникация.

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Introduction

The PECS, picture exchange communication system, was developed in 1985 to overcome the difficulties encountered in the use of various skills training programs for children with ASD [6]. Initially, the PECS system was designed to work with preschoolers with ASD and other social and communicative characteristics, which are characterized by the absence of purposeful or socially acceptable speech [1; 2; 5; 6].

Frost and Bondy [6] indicate that communication problems in these children are of a social nature: they rarely initiate communication with other people, avoid interaction with others, or begin communication only in response to direct instructions [7]. The first thing a person learns according to the PECS system is to approach a partner and give him/her an image of the desired object in exchange for this object [8; 9; 10]. Thus, the learner initiates the act of communication to obtain a specific result in a social context. According to Skinner's concept [21], care professionals need to

understand the principles of functionality, purposefulness of verbal behavior, and analyze speech from the point of view of a functional rather than a structural approach [22]. The functional units of speech, according to Skinner, are mand responses (making requests), tact-reactions (names of non-verbal stimuli), intraverbalizing (dialogue), echo (repetition of the statements of another person), and others.

In addition, Skinner considered combined type verbal operants [22]. These operants are under multiple control and are described by the author in terms of both a set of antecedent stimuli and a set of possible consequences.

The PECS alternative communication system includes 6 stages or phases [6]. Children using PECS first learn how to make requests using separate pictures, and in subsequent stages create various grammatical structures and statements using the pictures that perform a variety of communicative functions (requests, names, answers to questions, spontaneous comments on what is happening, etc.) [6; 8].

There are a large number of articles that provide research data on the correlation between PECS use and speech development in children with ASD who started PECS training at the age of 5 years and younger. For example, in the article by Bondy and Frost [7], observations of 67 children under 5 years of age using PECS for more than a year included the development of spontaneous speech in 59% of children. These children discontinued using PECS and used speech as their only form of communication (although they continued to have speech retardation). Another 30% of children used speech for communication and concurrently used PECS. Schwarz, Garfinkle, and Bauer [20] also convincingly support the use of PECS in teaching preschoolers with a variety of communication disabilities and note the positive effects of PECS on speech development. In addition to strong evidence of the effectiveness of the use of PECS by various educators, there is evidence supporting:

1. Reduction of manifestations of maladaptive/undesirable behavior after the introduction of PECS (Carpenter, Charlop-Christy, LeBlanc, Kellet, Sigafoos) [16; 19];
2. Improving social behavior (Le, Charlop-Christy [15]; Le, Charlop-Christy, Carpenter, Kellet [15, 16]);
3. Positive changes in speech development after mastering PECS (Carpenter, Charlop-Christy, LeBlanc, Le [12]; Carpenter, Charlop-Christy [13]). Observation of children using PECS during the period of acquiring speech skills has demonstrated the following phenomenon: the number of spoken words and the complexity of speech structures increase if children are given access to albums for PECS lessons (Frost, Daly, Bondy [14]). Many parents and professionals have expressed concern that the use of a picture system such as PECS could negatively affect the potential development of speech, especially when used by very young children. Studies conducted over the past 25 years (Carpenter, Charlop-Christy [13]; Ronski, Sevcik [18]; Mirenda, Erickson [17]) have demonstrated that additional communication systems (with or without special characters) do not interfere with the development of speech and increase the likelihood of developing or improving speech skills [6; 7].

The aim of this study was to demonstrate the possibility of the formation of speech responses in children with ASD using the PECS alternative communication system with the inclusion of a constant time delay strategy for the formation of primary vocal responses [6, pp. 159–166].

Methods

Teaching the functional communication using PECS in children

The study was conducted over a period of three months in toddlers attending the “My Planet” kindergarten. Children attended individual lessons three times a week for 45 minutes and group lessons twice a week for two hours. The schedule of individual lessons included PECS functional communication training, and the schedule of group lessons included the following activities of children in the kindergarten: communication group, music, warm-up and art lessons. During each group lesson, according to the conditions of the study, an accompanying tutor was next to the child, who followed the instructions of the group leader, helping his/her learner to complete tasks and creating situations of communicative temptation [1]. During these situations, there was a generalization of the asking skill in children, formed in individual lessons, by creating opportunities for adults for the child’s communicative initiatives.

The experiment involved three children with ASD and other behavioral characteristics, aged 2–4 years.

Information about the participants in the experiment, at the time of the beginning of the intervention:

Participant 1 – a boy, 3 years 2 months. Diagnosis: mixed specific disorders of mental functions; motor alalia, auto stimulatory behavior. The overall score for the “Assessment of development milestones” section of the VB-MAPP (3) was 13 points. Vocal speech averaged five identical sounds per hour. The child asked for two desired items using PECS cards, paid attention to other people’s words, to visual stimuli, and manipulated toys by studying them.

Participant 2 – a boy, 4 years 3 months. Diagnosis: ASD, alalia, delayed speech development. The overall score for the “Assessment of development milestones” section of the VB-MAPP (Sandberg, 2013) was 19 points. The child spontaneously pronounced 5 different sounds, in total, on average, 10 sounds per hour. The boy asked for four desired items using PECS cards, could point to an appropriate family member, match identical items, generalize play skills in an unfamiliar environment, play with other children, imitate several motor movements for an adult. Vocal imitation skills were missing.

Participant 3 – a boy, 2 years 8 months. Diagnosis: residual organic lesion of the central nervous system, delayed speech development with mild cognitive impairments, elements of auto stimulatory behavior. The overall score for the “Assessment of development milestones” section of the VB-MAPP was 6 points. The child’s speech skills included the same repetitive vocalization associated with autostimulative behavior. The skills of listener behavior,

motor and verbal imitation, as well as playing skills were lacking. The child paid attention to other people, smiled and turned his head to the source of the sound.

Quantification using Excel software was used to collect the data. For teaching children, the method of successive stages of the PECS system was used. In practice, the procedure was carried out as follows: before the start of training, by observing the learner, it was determined which objects the learner loves most, or which objects are the most powerful reinforcing stimuli. Next, the priority of the learner's preferences was determined by drawing up a "hierarchy of reinforcements". Then, pictures were used as materials for teaching, indicating objects with high priority for the learner. PECS teaching was conducted as a 4-stage process in the following sequence:

Phase I. At the first phase, children were taught to exchange a picture for an object in the hands of a communicative partner. The picture was placed directly in front of the child, and a communicative partner was waiting nearby, prepared at any time to exchange the picture for an object. At the same time, there was a physical prompter behind the child, waiting for the child's initiative to take the object, and at this moment providing him/her with a physical prompt to pass the picture into the open palm of the communicative partner;

Phase II. In the second phase, children were taught communicative persistence and distance – by the end of

the second stage, children could overcome the distance, look for a communication album, look for a partner and be persistent in communication.

Phase III. At the third phase, children were taught to distinguish pictures – first to distinguish between images of motivational and non-motivational objects, and then to choose the one they needed from two or more motivational stimuli.

Phase IV. Teaching the grammatical structure of the sentence. The PECS Communicative Album featured a sentence strip and children were taught to lay out a sentence structure of two or more pictures on the sentence strip.

Phase V. Answer to the question "What do you want?" Children were taught to lay out on a strip the structure of a sentence, an answer to a question, in the form of a request, as a response to a question.

Phase VI. Answers to the questions "What do you see?" "What do you hear?" "What is it?" Children were taught to lay out on a sentence strip the structure of a sentence, an answer to a question, in the form of social commenting, in the form of an answer to a question, or spontaneous commenting.

Teaching grammatical structures begins in PECS phase 4, and Frost and Bondy (2002) recommend four steps to generate these responses.

Step 1 – adding a picture with the image of the desired object to the template – the sentence strip. The "I want" picture is already on the sentence strip.

Table

Description of the PECS phases

PECS phase	Name DESCRIPTION	Purpose of teaching	Teaching procedure
Phase I	Simple exchange	How to initiate communication	3-step sequence: pick up a picture, reach, release. Prompt procedure with the aid of two people.
Phase II	Distance and persistence	Be able to be persistent in communication and overcome distance in search of a communication book and partner	Communicate with a variety of people, activities, locations and reinforcers.
Phase III	III A – simple discrimination	Be able to ask for the desired object and avoid the unwanted	Teaching to discriminate. 4-step error correction procedure
	III B – conditional discrimination	Discrimination between equally desirable objects	Correspondence check. 4-step error correction procedure
Phase IV	Constructing sentences	Putting together a grammatical structure of a sentence with a picture «I want»	4-step sequential teaching. At step 4: Prompt with constant time delay for the formation of primary vocal responses. The strategy of differentiated reinforcement for the request with speech or pictures.
Phase V	Answer to the question «What do you want?»	Putting together a grammatical structure of a sentence with a picture «I want»	Prompt with gradual increase in the time delay. Retention of spontaneous requests.
Phase VI	Commenting	Answers to the questions «What do you see / hear / feel / what do you have?» etc.	Discriminating sentence starters. Spontaneous commenting and requests.

Step 2 – moving the “I want” picture to the sentence strip.

Step 3 – pointing to pictures on the template while the other person reads the sentence strip.

Step 4 – here the authors of the procedure recommend using a prompt with a constant time delay for the formation of primary vocal responses, and a strategy of differentiated reinforcement for a request with speech or pictures.

It should be noted that when teaching the Step 4 of the Phase 4 of PECS, as part of the teaching strategy, we do not insist on the use of speech. PECS without vocal responses is itself a communication system that is completely suitable for children, and denying a child access to a desired object until he/she tries to say a word can lead to the disintegration of the formed communication skill. Therefore, it is important to use differential reinforcement at this stage of PECS. If the learner made an exchange, but did not speak, he/she received the object or action that he/she asked for. However, if he/she pro-

nounced the name of the object in a word, he/she received more reinforcement or for a longer period of time.

Results

The experiment demonstrated a positive pattern in the development of the skill of requests in three children 2–4 years old attending the early intervention group. All three participants in the experiment developed the PECS request skill, on average, 43 requests for each participant.

During the PECS training, two out of three children began to use speech, in one participant the number of vocal requests (words used) increased to 37, in the second one to 77, and the third participant made no vocal requests, but functional communication with the help of PECS remained.

Fig. 1 shows the changes in PECS request responses for each participant in the experiment.

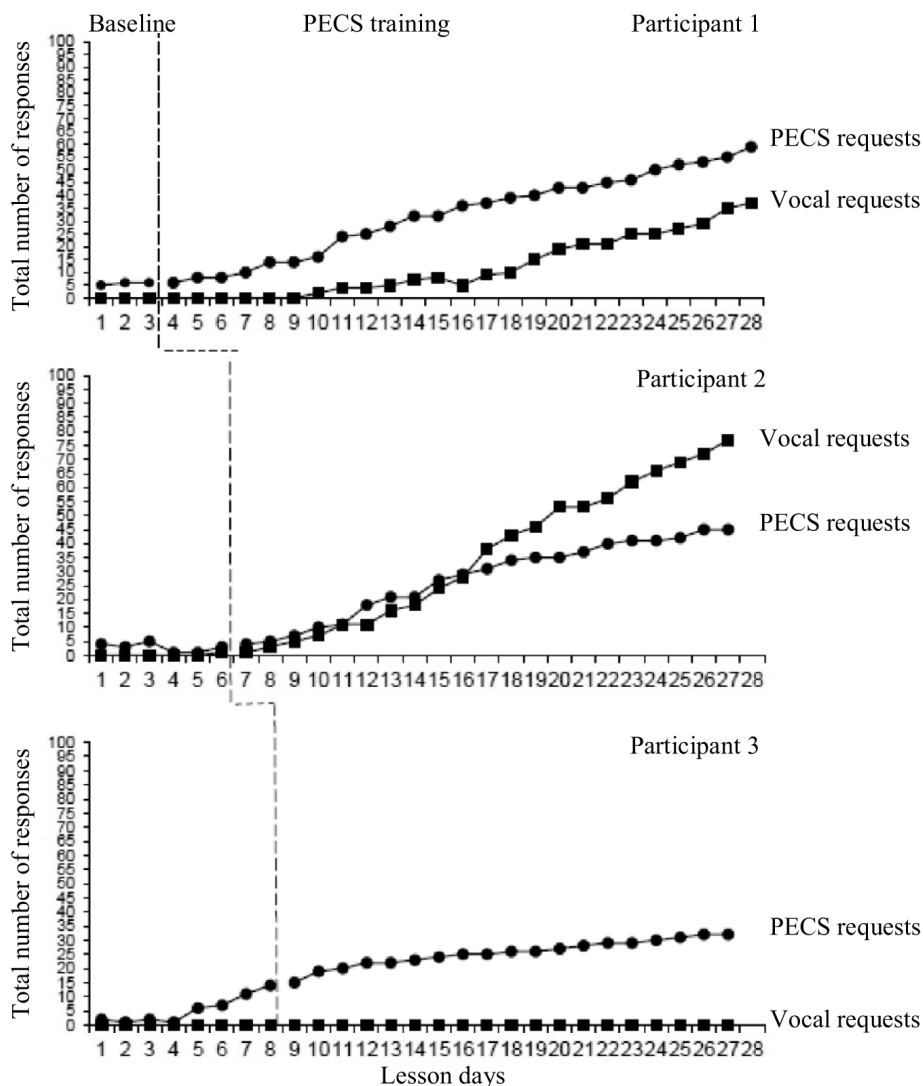


Fig. 1. Cross-individual multi-baseline design demonstrating the total number of vocal and PECS communication responses in participants during baseline and intervention recording

Baseline

During the baseline recording period, before an intervention, the PECS communication data of participant No. 1 showed six requests with pictures, participant No. 2 had five requests, *participant 3* demonstrated the skill of requesting with fourteen PECS pictures. Data on vocal requests were recorded only for participant No. 2 – one vocal request. The rest of the children had zero requests.

Results of intervention

For *participant 1*, the number of PECS requests increased from six to fifty-nine, vocal requests appeared at PECS phase III B, after five weeks of study that included

individual and group lessons at the center. During the lessons, vocal requests grew from two to thirty-seven.

For *participant 2*, the number of PECS requests increased from four to forty-five, vocal requests appeared in the phase IV of PECS, after two weeks of lessons. During the lessons, vocal requests increased to seventy-seven words.

For *participant 3*, the number of PECS requests increased from fifteen to thirty-two. Vocal requests were not formed.

The data in *Fig. 2* reflect the decrease pattern in the number of challenging behavior episodes in children. During three months of teaching functional communication, participant No. 1 had the number of challenging behavior episodes (“screaming”) reduced, on average, from 20 to 1 per lesson, participant No. 2 had the number of challenging behavior episodes (“crying”) reduced from 17 to 0, and participant No. 3 proceeded from 7 challenging behavior episodes (“crying”) to no episodes.

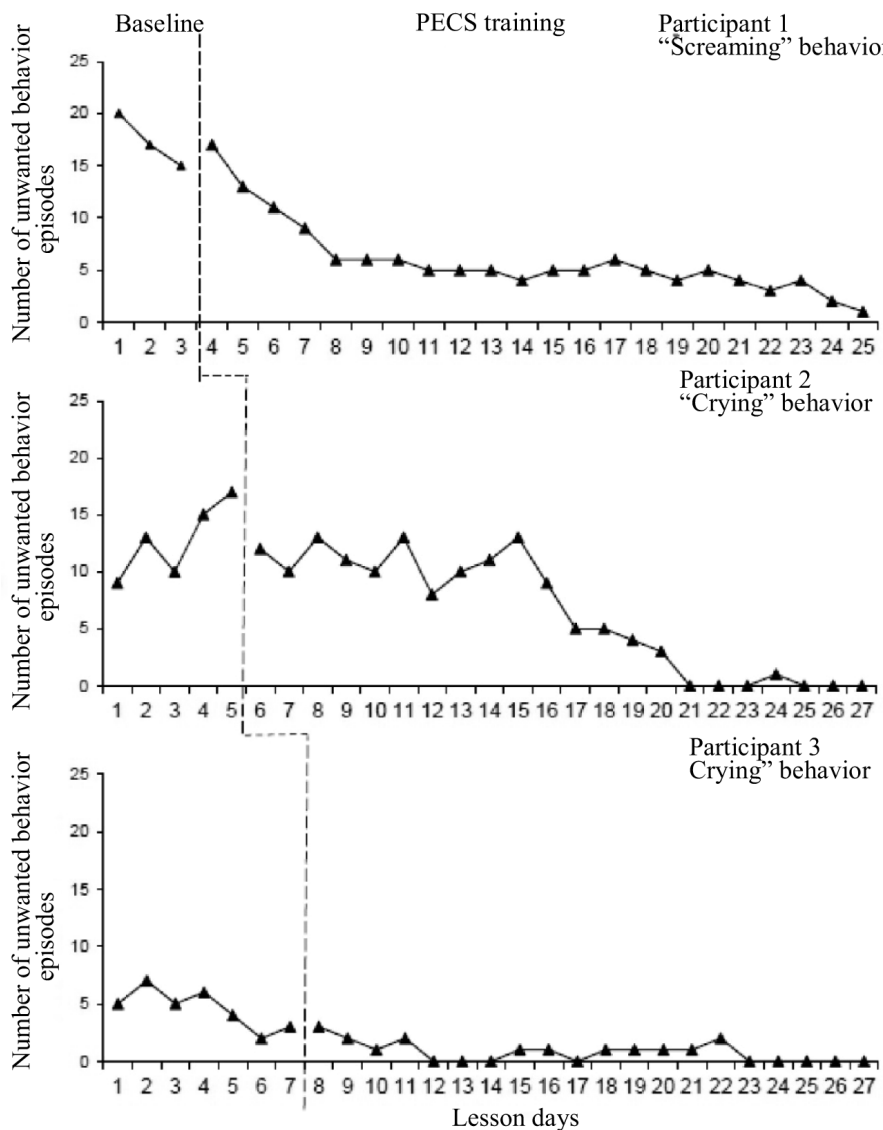


Fig. 2. Cross-individual multi-baseline design demonstrating the number of unwanted behavior episodes per lesson in participants during baseline and intervention recording

Discussion and conclusion

This paper validates the influence of the PECS alternative communication system on the speech acquisition in children with autism. Improved development of requesting skills was demonstrated as a result of teaching the functional communication using PECS in children aged 2–4 years in individual and group lessons. Two out of three participants developed vocal speech in the course of teaching under the PECS protocol.

The reduction in episodes of problematic behavior after the formation of the functional communication skill was also studied. It was concluded that children developing communication skills have a decrease in challenging behavior, up to the complete disappearance of episodes of problematic behavior.

Further scientific and experimental work is needed on the topic of vocal speech manifestation in children with ASD, as a result of teaching communication using the PECS method. Further research is also needed on the reduction of problematic behavior in children as a result of the development of functional communication skills.

The PECS method is routinely designed for teaching children not only in educational facilities, but also in everyday life. Teaching in a group or in individual lessons is not sufficient. This should be followed by maintaining the skill at home, in a natural environment. In this case, the skill is generalized and the desired behavior is reinforced. As a further activity, the parents were given the task of training the PECS skill at home, with different communication partners, in different environmental conditions (different premises, outdoors, in a store, etc.). ■■■

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