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Picture Exchange Communication System (PECS): A Short “tutorial” for the doctors

Picture Exchange Communication System (PECS): „Przewodnik” dla lekarzy

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Summary

One area of persistent difficulties for children with autism is communication, with about 25% of individuals with autism not developing spoken language at all. In light of this information, it is of paramount importance to have means of teaching those individuals how to pass to others information about their needs and wants in a socially appropriate and easily understood manner. Picture Exchange Communication System (PECS) is an empirically-validated alternative and augmentative communication method. In the present article we will provide a brief tutorial on PECS that may be of help to health care professionals who in their work come across children with autism.

Key words: autism, PECS, pictorial communication, language development

Streszczenie

Jedną ze sfer, która jest zaburzona u osób z diagnozą autyzmu jest komunikacja. Około 25% osób z autyzmem nie rozwija mowy jako sposobu komunikowania się. Jest zatem bardzo ważną kwestią, aby klinicyści mieli do dyspozycji metody nauczania osób z autyzmem przekazywania informacji w inny sposób niż słowami. Picture Exchange Communication System (PECS) jest opartą na dowodach i wywodzącą się z psychologii behawioralnej techniką uczenia porozumiewania się osób z autyzmem. W obecnym artykule przedstawimy krótki „przewodnik” po PECS. Mamy nadzieję, że będzie on przydatny dla lekarzy, którzy mogą mieć do czynienia z dziećmi z autyzmem. Założeniem jest przekazanie lekarzom wiedzy potrzebnej do dawania rekomendacji rodzicom odnośnie udowodnionych naukowo metod terapeutycznych dla dzieci z autyzmem.

Słowa kluczowe: autyzm, PECS, komunikacja obrazkowa, rozwój mowy

INTRODUCTION

In 2009 Golnik et al. (1) conducted a study to explore the perspective of general pediatricians and family physicians on primary care for children with autism in the USA. Results of this research revealed that doctors rated themselves much less competent and less educated in the area of developmental disabilities than in case of other childhood neurodevelopmental conditions. This is a concern taking into account that, according to Dosreis et al. (2), the majority of general pediatric providers have had contact with children with autism. Additionally, studies show that children with autism use health care services more often than typically developing children, presumably due to medical conditions that co-occur with autism as well as be-

havioral and emotional problems (3). Respondents in Golnik et al.'s study expressed a great desire for autism education, both from the perspective of improving knowledge base and as a likely means of increasing competency in daily practice. Such results are in line with the fact that primary health care providers differ in how much they know about autism, especially about prognosis, course and treatment when compared to professionals working directly with this population (4). Thus, it is of paramount importance to pass information from the clinicians and scientist-practitioners to medical doctors, so that a more comprehensive support for children with complex health care needs is provided.

One area of persistent difficulties for children with autism is communication (5). Not only is the develop-

ment of language delayed, but approximately 25% of children with autism do not develop functional speech (6). That means that if they are not taught alternative to speech ways of conveying their needs, wants and observations, they are virtually not able to pass various messages to others in a socially acceptable ways. A likely result of this is development of inappropriate behaviors that serve a communicative function (7). Applied behavior analysis (ABA) is a discipline that provided foundation for many effective techniques of teaching numerous skills to children with autism (8). Behavioral strategies have been successfully used to teach language to atypically developing children, both those who can speak and those for whom speaking is very difficult or impossible (9). For the latter group of pupils, one communication strategy that has its roots in ABA is Picture Exchange Communication System (PECS). Because of the popularity of PECS in clinical and school settings and its empirical basis (10), we believe it is important that primary health care providers are aware of this strategy, so they can make recommendations to parents, if needed. In the following paragraphs, we will provide a short "tutorial" on the characteristics and effectiveness of PECS. We also will briefly discuss some of the misconceptions associated with PECS.

Picture Exchange Communication System (PECS) was developed by Dr. Andy Bondy and Lori Frost as a method of teaching individuals with autism and other developmental disabilities how to engage in functional communication. It is usually, although not necessarily, a picture-based system that may serve as an alternative or augmentative communication. PECS is strongly based on basic principles of behavior, especially positive reinforcement and shaping of new responses, and it has its origin in B.F. Skinner's analysis of verbal behavior (11). The main focus of PECS is to teach spontaneous, functional social-communication skills (12).

According to Skinner (11), verbal behavior is learned behavior mediated through the action of others, which means that the reinforcement is dependent on the what someone else does. For example, if a child is thirsty, he can get a drink on his own (this would not be an instance of verbal behavior since the child's behavior was reinforced via a straightforward change in the environment) or he/she can get someone else to give him a drink by asking for it (this would be an instance of verbal behavior because reinforcement, i.e., the drink, was facilitated by another person). Frost and Bondy (13) write that "communication involves behavior (defined in form by the community) directed to another person who in turn provides direct or social rewards" (pg. 24). This definition can be treated as analogous to saying that functional communication is the exchange of information between at least two people. The message may be delivered using words, gestures, texts, images or symbols. Therefore, communication can be divided into vocal (words, vocalizations) and non-vocal communication (gestures, facial expressions, pictures,

symbols). However, communication is not mere gestures or words. In order to talk about "communication", certain conditions must be met:

- at least two people participate ("the speaker" and "the listener"),
- one person ("the speaker") has to address the second person,
- "the listener" responds to the message coming from the "speaker" in ways that have been conditioned precisely so that the behavior of the speaker is reinforced.

In other words, functional communication is a kind of an "exchange" of information between the speaker and the listener. The listener reacts appropriately to the activity of the speaker by providing reinforcement (e.g. giving attention or a desired item). As already mentioned, the communication does not have to be done by means of words. For example, pictures/gestures/ /written words can be used. In PECS, as the name suggests, pictures are used most often. What is most important, though, is that the transmission of information is understood by the people participating in the exchange of information.

PECS is not only the name of a system used by children with autism. It is also a well-designed protocol for teaching communication to pupils who have language delays (13). The PECS teaching protocol is based on B.F. Skinner's approach to understanding verbal behavior. Verbal behavior – or communication – is subject to basic principles of behavior and can be taught using behavioral techniques – reinforcement, prompting, shaping. A proper implementation of the PECS teaching protocol should ultimately lead to independent communication of the people who previously had difficulty with such an activity. The PECS teaching protocol consists of six phases which should be taught sequentially. Each phase should be mastered before teaching the next one is begun.

PECS PHASES

Phase I (Physical Exchange) teaches a child how to communicate. The student learns that if he wants something but does not have access to it, he needs to hand a picture to a communicative partner. It is important to remember that communication is about the exchange between two people – "the speaker" gives a picture to "the listener" and the listener, having understood the message, gives the desired item to the child. During this phase one should not ask the student directly about what he wants (e.g., "what do you want", "do you want it?" etc.). The student himself will show us what he wants at any given time (e.g. by reaching out for something). In the first phase, it is not crucial that there is actually a correct drawing on the piece of paper. As a matter of fact, the drawing is less of an essence than the exchange itself. In this phase, we do not teach discrimination (i.e., choosing) of one of two pictures, either. The student has only one picture available at a time. The first phase is mastered when

the student by himself (without any suggestions) picks up a picture of the item, reaches toward the trainer, and releases the picture into the trainer’s hand.

Phase II (Expanding Spontaneity) teaches the “triangle of communication” (i.e., me, my communication book, and my communicative partner). The student still uses individual pictures but at this stage he learns how to generalize the new skill. Generalization is ability to exchange information with a variety of communicative partners (e.g., mom, dad, grandma), in many different settings (e.g., preschool, kitchen, playground) and under diverse conditions (e.g. the listener is standing far away, the listener is turned away from the child). At this stage, we teach persistence in communication! We still do not teach discrimination. Phase II is mastered when the student is able to find his own communication book and the communication partner to whom he must pass the picture.

Phase III (Picture Discrimination) teaches selecting the correct image from many possibilities. The student learns how to make a choice between two or more images to get the item that he really wants to get. Pictures can be found in the communication book (in the form of a binder) and they are attached with a Velcro tape, thus being readily available at the time of communication. First, we teach how to discriminate between highly desired items and the undesired ones, later the desired versus neutral and at the end we proceed to the two desired objects. During the exchange, one should remember about naming the items as we give them to the student after the communication takes place. Furthermore, in this phase we begin to teach the meaning of the words “wait” and “no”. We can move to the next phase only if the student chooses the item that corresponds to his desires at the time. In addition, the student should look into the book to find the picture.

Phase IV (Sentence Structure) teaches the student to “utter” longer requests. The student learns to construct simple sentences by means of a sentence strip, using the picture “I want,” and then an image of the object that he asks for. The student gives his sentence strip to the communication partner who reads the sentence “I want...”, waits maximum 5 seconds for a verbal reaction and then adds the name of the item, such as, for instance, “a car”. In this way, the child is encouraged to speak. One should augment the successful vocal attempts. We can move to the next phase only when the students learns how to make his own sentence strip. When the skill is mastered, the student often moves to phase V and learns how to make elaborate sentences by adding adjectives, verbs and prepositions.

Phase V (Responding to “What do you want?”) teaches how to respond to questions. The student learns to use PECS in order to answer the following question: “What do you want?”. One should alternate between spontaneous opportunities to ask and to reply to the question “What do you want?”. We can move to the next phase only if the student responds to the

question “What do you want?” and spontaneously makes requests by himself.

Phase VI (Responsive and Spontaneous Commenting) teaches commenting on what happens in the surrounding environment. The student learns how to comment and respond to such questions as: “What do you see?”, “What do you hear?”, “What do you feel?”, “What is it?”. He learns to make sentences with “I can see...”, “I can hear...”, “I can feel...”, “This is...” etc. At the end of this phase, the student should ask questions spontaneously, answer them using the vocabulary and primer in a sentence as well as comment on the surrounding environment. One must remember to check the student’s skills regularly and create situations in which he may use them. During the PECS implementation one has to teach the student how react to the word “no” correctly.

Since mid 1990s when PECS was developed, there have been about 60 studies looking at various aspects of the system. As for parents of children with autism and professionals who may come across those parents, it is very important to know how effective is PECS. Below we will present the results of three recent reviews (meta-analyses) of single subject studies devoted to PECS:

- Hart and Banda 2010 (14)
- Preston and Carter 2009 (15)
- Flippin, Reszka and Watson 2010 (16)

We chose those studies, as in the last 30 years meta-analysis has been accepted in the social and health sciences as a very useful and helpful research methodology to quantitatively integrate the results from different studies (17, 18). The most commonly used statistical index for single-subject designs is the percentage of non-overlapping data (PND) (16, 17). The PND is the percentage of intervention data points that are above (when behavior increase is expected) or below (when behavior decrease is expected) the highest (or lowest) baseline data point. If a study includes several experiments, PND scores are aggregated by taking the median.

Interpretation of PND as described by Scruggs and Mastropieri (19) is as follows: scores between 91 and 100 indicate highly effective interventions, between 71 and 90 moderately effective interventions, between 51 and 70 questionably effective interventions, and 51 or below ineffective intervention.

Based on the three above-mentioned studies, we will describe the effects of using PECS on overall communication skills, on speech development and on levels of problem behavior.

Overall communication abilities. The overall effectiveness of PECS training was indicated in terms of increases in communication exchanges, speech, and social behavior as well as decreases in problem behavior. Two meta-analyses included the measure of overall effectiveness (14, 15). Hart and Banda (14) meta-analysis presented the following results: the intervention was highly effective for 19 of 35 participants, moderately effective for 10 participants, minimally effective for 5 participants and showed no effect for

1 participant. In terms of overall effectiveness, PECS training was effective (highly and moderately) for 83% participants. Second meta-analysis was computed by Preston and Carter (15). According to its results, PECS training was highly effective for four of ten studies, moderately effective for two studies and questionably effective for four studies. In this meta-analysis authors calculated overall mean PND for all studies and it was 78.5% (moderately effective). In sum, PECS training was an effective intervention to increase overall communication abilities (exchange picture, speech, social behavior – e.g. pointing) for children with autism.

Picture exchange (augmentative and alternative communication). Communication outcomes included frequency of use of PECS, exchanges, requests and initiations. Preston and Carter (15) meta-analysis presented the following results: in terms of picture exchange, PECS training was a highly effective intervention for six of nine studies, moderately effective for two of nine studies, and questionably effective for one of nine studies. The overall mean PND for picture exchange was 90% (between moderately and highly effective). Very similar overall mean PND for picture exchange obtained Flippin, Reszka and Watson (16), and it was 84.3% (moderately effective). In this meta-analysis for the following measures – picture exchange, PECS training was a highly effective intervention for three of five studies and a questionably effective application for one study. In sum, PECS was shown to be an effective intervention to increase functional communication, which is augmentative and/or alternative to speech.

PECS versus other interventions. Hart and Banda (14) described a comparison of PECS with a sign language intervention and PECS with VOCA (Voice Output Communication Aid). PECS was highly effective for 5 of 6 participants and moderately effective for 1 participant. Sign language was highly effective for 2 of 6 participants, moderately effective for 1 participant, questionably effective for 2 participants and showed no effect for 1 participant. In sum, PECS appears to be a more effective intervention than sign language to increase functioning communication. However, the next comparison, i.e. PECS to VOCA, showed different results. PECS was highly effective for 3 of 9 participants, moderately effective for 4 participants and questionably effective for 2 participants. VOCA was highly effective for 2 of 9 participants, moderately effective for 5 participants and questionably effective for 2 participants. Thus, PECS and VOCA appear to be equally effective interventions to increase functional communication.

Speech development. All three meta-analyses included results for speech development. Hart and Banda (14) meta-analysis presented the following results for speech gains: PECS training was highly effective for 2 of 10 participants, moderately effective for 2 participants, questionably effective for 2 participants, and showed no effect for 1 participant. PND for 3 participants could not be calculated for speech because of unclear data. These results suggested that for some

children PECS training may be an effective intervention to increase speech (vocal communication). Preston and Carter (15) meta-analysis showed less optimistic results for speech gains. For speech development, PECS training was highly effective for one of four studies, questionably effective for one study and showed no effect for 2 studies. The overall mean PND for speech development was 49.8% (questionably effective). Flippin et al. (16) meta-analysis showed similar results. For speech development, PECS training was highly effective for one of four studies, questionably effective for one study and showed no effect for 2 studies. The overall mean PND for speech development was 44.7% (questionably effective). Researchers found a relationship between speech development and phases during PECS training (14-16). Usually spontaneous and imitative speech increased during the later phases of PECS (IV to VI). Phase IV introduces sentence structure and time delay strategies. The trainer says “I want...” and briefly pauses (4-5 sec.) before giving the requested object to the child and finishing the sentence. Thus, time delay serves as an establishing operation for naming the desired item. It is important to remember, though, it is not only phase IV in which verbal modeling takes place. As a matter of fact, this strategy (i.e., saying the name of the desired object once the child hands in its icon) is done beginning with phase I.

Reducing problem behavior. In terms of reducing problem behavior, Hart and Banda (14) showed that PECS training was a highly effective intervention for one of four participants, moderately effective for two participants, and questionably effective for one participant. Preston and Carter (15) meta-analysis described just two studies for problem behavior. For a reduction of problem behavior, PECS training was a highly effective intervention for one study and moderately effective for other one study. This results suggested that PECS is an effective intervention for decreasing problem behavior (e.g. tantrums, grabbing, out of seat, throwing objects).

Based on the above mentioned meta-analyses we may conclude that PECS training has been highly or moderately effective for many participants (more than half) with autism in increasing functional communication skills. Moreover, some participants that used PECS increased speech and decreased problem behavior. On balance, the reviewed studies provide evidence that PECS training may be an effective intervention for children with autism who have little or no speech. A very recent publication by Maglione et al. (20) provides guidelines regarding nonmedical interventions for children with autism. Based on a systematic review of scientific evidence, the authors conclude that research regarding PECS offers moderate strength of evidence of efficacy (i.e., the experts were reasonably confident of the intervention’s positive effects). Investigators recommend that “individuals with autism spectrum disorders who have limited verbal language, or those who do not respond to multiple interventions aimed at improving communication, should be offered the opportunity to

use PECS” (pg. 175). In the same article, Maglione et al. mention that they had not identified any controlled trials or observational studies on the efficacy or effectiveness of Augmentative and Alternative Communication (AAC) tools. PECS is well suited to be transitioned to a variety of AAC, including high-tech speech generating devices (SGDs). Frost and McGowan (21, 22) write about critical factors in transitioning from PECS to SGDs. This publication is noteworthy as PECS is often the first intervention implemented for children who do not speak, but as they progress through PECS phases (usually after they have mastered Phase IV), parents as well as professionals may want to move to a system which accommodates expanding vocabulary and complexity of communicative interactions. The authors emphasize the fact that in order for the transition from PECS to SGDs to be successful it must be done so that the individual does not lose any current communication abilities. Despite the fact that nowadays we have more information on the effectiveness of PECS than even five years ago and that this system is widely used, at least in the US (23), many common misunderstandings about this therapeutic application are still prevailing. Some of them are listed in Bondy (24) and summarized below:

If you use visual stimuli, it is PECS

The effectiveness of the PECS training is not based on a specific kind or number of pictures, but on the assumptions of the whole system and how it is implemented. An important element of this system is to learn that the functional communication serves as a tool to exchange information (for example, by means of visual stimuli, but not necessarily). One may use visual stimuli and not use PECS at all.

If you use activity schedules, it is PECS

The PECS system is based on “active speech”, the person “asks” for things he wants or “says” what is of interest to him. The activity schedule, on the other hand, refers to “passive speech”, as the person “reads/recognizes” what he or she would do.

PECS is developed only for children who do not speak

This system can be used as an alternative or augmentative communication depending on the child’s needs. This means that it can be used by children who do not speak at all as well as the ones who have difficulty speaking. (e.g. indistinct pronunciation). The idea behind using PECS for children for whom speech is a strenuous activity is to lower the effort needed for communication, thus reinforce verbal behaviour meanwhile working on clearer or easier production of words.

If you start to use PECS, you stop teaching how to speak

In PECS, the communicative partner always tries to promote speech (e.g., via naming pictures that are given to him by the speaker before an exchange takes

place, by introducing a time delay between first part of the sentence (i.e., I want) and the name of the desired object). Thus, teaching that speaking is an ubiquitous activity is an inherent part of PECS.

If you start using PECS, the child will have no motivations to learn how to speak

The development of speech is related to many factors, such as: the age of the child, history of reinforcement for speaking, level of impairment and, thus, may not depend solely on using or not using PECS. Thus, by introducing PECS we give a student additional support to convey a message to the other person. We do not take away motivation to learn how to speak. Just the opposite, via providing many models of speaking while teaching PECS, we model to the children that communication with the aid of the language is faster and has immediate results as opposed to pictorial communication (you need to find the right picture and give it to the person). For some children PECS leads to vocalizations and use of speech and for some others, it does not. The difference seem to be related to the nature of autism.

As soon as the child begins to speak, we should quit using PECS

Do not take the PECS book away from a child because by doing so we would remove the tool that the child uses to communicate with the environment. The child will reject PECS naturally as soon as he notices that other people understand what he says (vocally). Usually, “shifting” from the PECS book to speech takes place gradually and is directed by the child. Non-vocal verbal behavior is slowly replaced by another operant which serves the same function – vocal verbal behavior.

PECS means giving the child anything he wants

Only in Phases I and II one should make sure that the child has received the item he is asking for. In these phases, the child is taught that communication has the power and by means of it he can say anything he wants. In the later phases, the child learns to accept a “no” and the information “wait”.

PECS is only for young children with autism

Indeed, the PECS protocol was developed in the late 1980s for young children with autism. Since then, however, there have been several studies conducted investigating the effectiveness of the system for adults with a variety of communication handicaps. Research has also been done with children with other disabilities than autism (e.g., cerebral palsy, blindness, deafness, multiple disabilities). Certainly more research with varied populations is needed but based on the available data PECS seems to be a viable communication intervention not only for children with autism.

There is no empirical research devoted to PECS

The overview of literature spanning over the last 15 years (since mid-1990s) shows that there are more

than 60 empirical studies, several comprehensive reviews and also a few meta-analyses related to PECS. Although their results are varied, some of them describing PECS as an established effective intervention, others portraying PECS as a promising method for increasing communication skills – researchers agree that the PECS protocol “appears to be associated with improvements in communication and speech production and with other positive behavior changes” (24, pg. 811).

In conclusion, PECS is a method that has been created specifically for individuals who have language

development difficulties. It is based on applied behavior analysis and thus is supported by strong theoretical foundation – mainly Skinner’s analysis of verbal behaviour – and empirical research. The system itself has been evaluated in a number of separate studies as well as few meta-analyses. The overall conclusion is that PECS is an effective, evidence-based method that teaches children how to communicate effectively and efficiently. It also reduces rates of problem behavior and for some children is associated with speech development. For interested individuals, more information on PECS can be found at: www.pecs.com

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