Critical Review: In Children with Nonverbal Autism Spectrum Disorder, does the Picture Exchange Communication System Facilitate Speech?

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This critical review examines the evidence regarding the effectiveness of the Picture Exchange Communication System in facilitating speech in nonverbal children with Autism Disorder. Study designs include: a randomized clinical trial, a within groups (repeated measures) design, a mixed (between and within) design, and a systematic review. Overall, evidence gathered from this review is inconclusive. Recommendation for future research and clinical practice are provided.

Introduction

Autism Disorder is a Pervasive Developmental Disorder that is characterized by abnormal or impaired social interaction and communication (American Psychiatric Association, 2000). The prevalence of Autism Spectrum Disorder (ASD) has been steadily increasing in the last two decades. ASD is now recognized as the most common neurological disorder affecting children and is seen in approximately 1 of 200 Canadian children (Autism Society Canada, 2010). Depending on the chronological age and the developmental level of the individual, presentation of the disorder can vary greatly (American Psychiatric Association, 2000). Some individuals with Autism Disorder are completely non-verbal, or have only a few spontaneous or imitated words. There have been many programs and therapy tools developed to help these individuals communicate more easily. One such program is the Picture Exchange Communication System (PECS). PECS is an augmentative system that can be used with families, educators, and other care providers in a large number of settings (Pyramid Educational Consultants, Inc., 2012). It has been widely used by speech-language pathologists (SLP) in Canada for individuals with a broad range of disorders and chronological ages. However, it is primarily introduced to preschool age children as an alternative means of communication with others. Given the number of non-verbal preschoolers diagnosed with ASD, it is essential that SLPs are informed about the most effective therapy programs available for fostering communication. There has been considerable research completed on the effectiveness of the PECS System. This system has been proven to be a valuable tool for working with children in this disorder area. However, a significant concern for parents is that their children may replace spoken language with the picture exchange system, and therefore, not become, or continue being, a verbal communicator.

Given the number of preschool children with ASD, and the prevalence with which the PECS system is used, it is essential that research be done on the effect that this system has on spoken language. Reviewing the research in this area will enable SLPs to appropriately respond to parents' concerns regarding their children's' spoken language when they are being introduced to the PECS system. Additionally, this will help parents to make informed decisions based on evidence from research, for the betterment of their children.

Objectives

The primary objective of this paper is to provide a critical evaluation of existing literature on the impact of the PECS system for facilitating spoken language in preschool and younger school aged children who have been diagnosed with ASD. A secondary objective is to offer evidence-based recommendations regarding the use of the PECS system in this population and areas for future research.

Methods

Search Strategy

Articles related to the topic of interest were found using the following computerized databases: Medline, PsychINFO, and PubMed. Keywords used for the database search were as follows:

Autism AND (Picture Exchange Communication System OR speech)
autism picture exchange communication system speech

The search was limited to articles written in English.

Selection Criteria

Studies selected for inclusion in this critical review were required to investigate the impact of the PECS system on spoken language in nonverbal children with ASD.

Data Collection

Results of this literature search yielded four articles congruent with the aforementioned selection criteria: a randomized clinical trial (RCT), a within groups (repeated measures) design, a mixed (between and within) design, and a systematic review. Overall, evidence gathered from this review is inconclusive. Recommendation for future research and clinical practice are provided.

Results

Study #1. Charman, Gordon, Howlin, Pasco, and Wade (2007) conducted a randomized clinical trial to examine the relationship between PECS training for teachers and children with ASD. This study was conducted with 84 participants between the ages of 4 and 11. Results of the study indicated that there was no increase in the frequency of speech during or after the PECS program was implemented.

The 84 elementary school participants were found in 18 different class groups. These class groups were randomly put into one of three groups: immediate treatment, delayed treatment, and no treatment. Treatment was given in two different periods. Measurements were taken at baseline, and then following the first and second treatment periods.

Information and data was collected through indirect observation, and a number of standardized assessments such as The Expressive One Word Picture Vocabulary Test, the British Picture Vocabulary Scales, and the Autism Diagnostic Observation Schedule-Generic (ADOS-G).

Multilevel ordinal regression models were used to investigate patterns between treatment and each of the outcomes. Three independent baseline variables were added into the analysis: age, non-verbal developmental quotient (NVDQ) and ADOS-G language rating. The authors concluded that the study failed to demonstrate any increases in spoken language or scores on language tests. The results indicated that treatment was associated with a decrease in severity according to the ADOS-G rating.

Study inclusion criteria, randomization, treatment, and assessment were reported in adequate detail. Outcome measures were discussed in considerable detail in this study and were measured in a variety of ways. However, the results only pertained to two outcome measures: changes in classroom ratings, and changes in ADOS-G domain scores. The discussion of the effect of PECS on speech lacked detail and pertinent information such as specific numbers linking the relationship between the PECS system and spoken language.

Charman et al. (2007) were aware of the limitations of the study and reported them in adequate detail in the paper. They also related their results to the existing literature, as well as presented clinical implications that the results could have.

Study #2. Carpenter, Charlop-Christy, Kellet, and LeBlanc (2002) conducted a within-groups (repeated measures) study with three children with ASD. Results of the study indicated that the three children showed concomitant increases in verbal speech with PECS training. It was concluded that gains in verbal speech were associated with increases in social-communication behaviours and decreases in problem behaviours.

The selection criteria for all three children were reported in adequate detail. The three children were chosen because of their diagnosis and because they were the first three children in the program after the initiation of the study. Each child either did not speak, or spoke only rarely. Therefore, each subject was chosen based on spoken language criterion, rather than by severely of their ASD. The criteria for subject selection could have been more detailed.

Carpenter et al. (2002) clearly described the procedure of the study. The therapists would give the children opportunities to produce both spontaneous and imitated speech one time every minute so there were a large number of trials produced. They described many important factors such as stimulus preference assessment, the actual PECS training, the posttraining, and the long term follow-up. The authors of this paper provided adequate detail when introducing and explaining these extra considerations.

The authors of this paper also presented their results in a very organized and detailed manner. Not only did they consider spontaneous speech and imitation during and after the PECS training in this report, they also included the measurement of mean length of utterance (MLU). They presented the results individually for each measure. The results of this paper were written in considerable detail and were accompanied by a number of graphs and visual representations.

Carpenter et al. (2002) were careful when they came to the conclusions of why the children's speech production increased in this study. The discussion presented a number of reasons why there were increases in speech production such as social reinforcers, the pairing of the phases spoken by the adult with the pictorial act of handing the PECS strip to the partner, the use of delay that is seen in the PECS procedure, and the phase number of the PECS system in which the children were involved.

Potential improvements of the study were presented along with the limitations such as the small sample size. It was also noted that future studies should examine the generalization and maintenance of the spoken language skills of the children included in the study.

With the exception of the selection criteria portion, this study was presented in a clear, direct way with a large amount of detail pertaining to the acquisition of spoken language skills during and after PECS training.

Study 3. Carr and Felce (2006) conducted a mixed (between and within) study to investigate the increase in production of spoken words in 24 children between the ages of 3 and 7 with ASD after PECS training to Phase III. The authors reported that five of the 24 children in the study showed concomitant increases in speech production in either imitated speech, spontaneous speech, or both. No children in the PECS group showed a decrease in spoken language.

The selection criteria for both case and control subjects was reported in detail, with case controls matched according to age, assessed language results, and adaptive behaviour levels. Carr and Felce (2006) clearly defined the procedure for both the treatment and control group. A pre-

treatment observation period was conducted six weeks before PECS was commenced in the children's classroom environment in order for the researchers to gather language and communication samples. Formal assessments were conducted one week before the PECS training began in the form of the Vineland Adaptive Behavior Scales (VABS) and the Preschool Language Scales–3 UK (PLS-3 UK). This allowed the researchers to gather information regarding the natural maturation rate of the children included in the study. PECS training was completed over a four to five week period for the treatment group.

There were a number of limitations that this study presented. For example, this study did not report corrections to establish normal distribution. The results were not interpreted with great detail, although the discussion depicted the results well. Standard deviation and confidence intervals were also not reported in this paper.

While the design employed was appropriate for this population and provided moderate strength of evidence, the above-mentioned weaknesses in methodology need to be considered before implementing the results in clinical practice.

Systematic Review. The authors of this systematic review, Carter and Preston (2009), discuss the effect of the PECS system on the use of spoken language.

The articles included in this review were required to follow three clear guidelines. First, journal articles were required to be in English from 1992 to July 2007. Second, articles needed to use PECS as whole or part of an intervention strategy. Lastly it was required that group or individual data on the results of the intervention be presented. Articles were also required to follow the PECS developers' (Any Bondy and Lori Frost) protocol. The 27 studies that met these criteria, summarized and provided basic information regarding number of participants, diagnosis, ages, research design, along with more detailed information such as maintenance or generalization, and the PECS phases completed.

Although the article provided a useful summary chart, the studies examined by the authors related to speech could have been discussed more specifically. In particular, discussions regarding which studies resulted in an increase or decrease in speech were completely omitted. The discussion could have gone into more depth regarding the external factors that could have affected the results such as the ADOS-G score, chronological age, and severity of the disorder.

This article is valuable because it maintains that this is merely a preliminary review and that it should be a high research priority to conduct more RCTs in order to determine the efficacy and effectiveness of PECS on speech.

Overall, Carter and Preston (2009) suggest that a considerable amount of research be conducted in order to determine the effect of the PECS system on spoken language, as the relationship as of yet, remains unclear.

Discussion

Overall, the examined research provides variable evidence regarding the impact of PECS on spoken language in children with nonverbal ASD. More specifically, researchers have identified both negative and concomitant associations between PECS training and increases in spoken language.

Despite limitations discussed with each article, the literature reviewed suggests that there is a weak correlation between PECS training and an increase in spoken language. However, there appears to be other factors influencing this relationship. One such factor is the functioning level of each child. Children diagnosed with ASD can fall anywhere along the Autism Spectrum. This makes it difficult, if not impossible, for researchers to conduct studies in which the children are well matched in skill level in the areas that are being researched. Receptive and expressive language skills are important to consider when choosing participants for a study. It will help the researchers establish a baseline to which they can judge their results. After reviewing the literature, it was clear that researchers chose their participants based on a number of different factors, which makes it difficult to compare one study to another. Carpenter et al. (2002) were the only researchers to identify the language equivalency age of each child. It is important to have this information available because children diagnosed with ASD can vary in a number of ways that pertain to language and speech development.

Another factor that needs to be considered is how the PECS training was administered. PECS consists of six phases and it is important that each phase be taught correctly by someone who has undergone the appropriate training to administer this system. The literature varies in the phase that is achieved before analyzing the results for each participant. The literature also varies in the intensity of the program. These factors make it difficult to compare the reviewed literature.

With the exception of Charman et al., the reviewed literature worked with small samples sizes. Although it is impossible to get a large homogeneous group of children with ASD, it is important that researchers strive to work with larger sample sizes of children with similar characteristics.

It is also important to note that although there are many studies directed at establishing the effectiveness of PECS, there are few studies that look specifically at the relationship between PECS and spoken language. More research needs to be conducted in this area.

Although the relationship between PECS and spoken language remains unclear at present, future research in this area could provide insights into this relationship.

<u>Recommendation for Future Research</u>

a) Future research should be conducted with larger sample sizes in order to make more accurate inferences about the

population of interest.
b) Future research should employ study designs that offer a stronger level of evidence so that results can be applied more appropriately to clinical practise.
c) Studies should systematically report the severity level of each child on the Autism Spectrum in order to improve understanding of the effects of the intervention.
d) Studies should report in detail the PECS training schedule in order to better understand the relationship between the intensity of PECS training and spoken language.
e) Future studies should examine the generalization and maintenance of any spoken language skills acquired with PECS training.

Conclusion

At present, a concrete statement regarding the impact of PECS on the facilitation of spoken language in this population cannot be made, due to the various research results and the limited research directed at this question specifically. However, it is thought that children who take part in PECS training show concomitant increases in spoken language, and that training of this program does not result in a decrease of spoken language. More research needs to be done specifically in this area.

Clinical Implications

Due to limited strength of evidence, it is recommended that clinicians be cautious when implementing the findings of these studies into clinical practise.

Although this review did not support a strong relationship between PECS and spoken language, it is important to note that a number of studies concluded that there is a concomitant increase in speech with PECS training. It is also important to note that PECS does not lead to a decrease in spoken language.

Due to the lack of harm that PECS has on spoken language, and on the extra modality of communication that this system provides to children, PECS should be an important consideration when working with children with nonverbal ASD. However, the clinician should treat each child as an individual, and help the parents and child choose a communication modality that best fits the child.

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