

Critical Review: Language Outcomes for Children with Autism: A Comparison Between PECS and Sign Language

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This critical review compares language outcomes for children with autism when using the Picture Exchange Communication System (PECS) and sign language. Three single subject multiple baseline studies are discussed. Overall, research shows that each intervention has different advantages and disadvantages, and individual differences also play a role in outcomes. Recommendations for future research and clinical practice are provided.

Introduction

Autism is a disorder which has a broad range of symptoms and levels of severity. Although there is a range of symptoms, three main areas of impairment are common to all autistic spectrum disorders: social relationships, social communication and imaginative thought (Sicile-Kira, 2004). Children with autism may have a variety of behavioural characteristics as a result of these impairments, including limited eye contact and social initiation, unusual play behaviour such as lining up toys in a row, and abnormal use of language, such as echoing back phrases previously heard (echolalia) (Sicile-Kira, 2004). In addition to having abnormal language, it is currently estimated that 40-50% of children with autism will be non-verbal into adulthood without appropriate early language intervention (Autism Society Canada Website, 2007 and Tincani, 2004). Due to the number of children with autism who are non-verbal, there are currently several interventions being used to stimulate language and communication development, including use of manual signs (e.g., American Sign Language) and graphic symbols (e.g., the Picture Exchange Communication System) (Mirenda, 2003). Each of these interventions has a body of research indicating positive communication outcomes for children with autism.

The Picture Exchange Communication System

The Picture Exchange Communication System, or PECS, was developed in the 1990s by Bondy and Frost as a communication method for children with autism. This communication intervention uses graphic representations of objects (e.g., line drawings, photographs) to represent real objects. In this system, children are initially taught to exchange a picture with a

communication partner for a desired item with maximal prompting. Over time, the children learn to initiate the exchange to receive the desired item, and to travel over a distance (e.g., across a room) to give the picture to a communication partner. Children also learn to discriminate between different pictures that represent different items. Eventually, sentence structure is introduced, where the child learns to place pictures on a "sentence strip" in the structure of "I want ____". Finally, the authors suggest that this system can be used to teach other grammatical structures such as responding to yes/no questions ("this is a ____") commenting on what one sees ("I see ____"), and actions of oneself or others ("John is playing ball") (Bondy & Frost, 1994).

There is evidence to support positive language outcomes for children with autism who use PECS. Bondy and Frost (1994) reported that 59% of children whose first communication system was PECS eventually acquired speech as their primary method of communication. Additionally, they reported an increase in initiation of requests and approaching others socially. These positive outcomes have been supported in research since that time (Bondy & Frost, 1998; Charlop-Christy, Carpenter, LeBlanc, & Kelle, 2002; Schwartz, Garfinkle, & Bauer, 1998, all cited in Ganzl & Simpson, 2004). Clearly, there is strong support for the use of PECS as a language intervention for children with autism. However, there are other interventions which have also been used successfully, and may have different communication benefits due to the use of modalities other than graphic representation.

Sign Language

Sign language uses manual hand signs and movements to represent objects and concepts. Although there are full languages that use signs (e.g., American Sign Language), children with autism are generally taught individual signs, as labels, rather than using the complete grammatical structure of the language (Mirenda, 2003). Past research has found that children with autism who are taught to use sign language in addition to speech learn new vocabulary more quickly, and have a larger expressive/receptive vocabulary (Mirenda, 2003). Many signed representations of concepts are more iconic than pictures or spoken words (e.g., the sign for 'drink' is a gesture imitating drinking from a cup), which may make signs easy to recognize and use for people with disabilities, including autism (Anderson, 2001). There has been much research into the effectiveness of using sign language as a communication modality for children with autism, with varied success in terms of level of language development, maintenance and generalization of skills, and subsequent development of spoken language (Anderson, 2001). Although there are varied levels of success, it is apparent that children with autism are able to achieve positive language outcomes when using sign language.

Objectives

The primary objective of this paper is to critically evaluate literature comparing language and communication outcomes for children with autism using Picture Exchange Communication System and sign language. The secondary objective is to propose evidence based recommendations for future practice and research in language interventions for children with autism.

Methods

Search terms

Computerized databases including CINAHL, Medline and Scholars Portal were searched using the following search strategy: [(Autism Spectrum Disorder) OR (ASD)] AND [(ASL) OR (Sign Language)] OR [(PECS) OR (Picture Exchange Communication System)] The search was limited to articles written in English and published between 1987 and 2007.

Selection Criteria

Studies that were included in this critical review paper directly compared the effectiveness of the Picture Exchange Communication System and sign language as an intervention technique for children with autism.

Data Collection

Results of the literature review yielded three alternating treatments design studies, two of which were PhD dissertations.

Results

Each of the following studies directly compared PECS and sign language, and examined communication outcomes for each intervention for children with autism. Due to the design of these studies and small sample sizes, statistical analyses were not conducted; however, visual inspection of the data was used to determine trends in the data.

Anderson (2001) reported her findings regarding a comparison of PECS and sign language and individual child characteristics affecting preference for each modality, in her PhD dissertation. Six non-verbal children with autism between the ages of two and four participated in the study. The participants were recruited from the UCSD Autism Research Laboratory subject pool, or referred from psychologists. The experiment used a single subject, alternating treatments, multiple baseline design across participants to identify individual differences in a variety of outcomes. The multiple baseline design of the study was used to demonstrate that effects observed were in fact due to treatment, rather than developmental maturation. Initial baseline data were collected to monitor the participants' communication skills before learning to use PECS and sign language. The treatment was conducted in several identical rooms, with generalization probes later conducted in a different environment. The participants were assessed with measures of severity of autism, joint attention, motor and vocal imitation skills, play skills, language comprehension and preferred stimulus items. The children received treatment in both PECS and sign language, in 4 sessions a day, three days a week. The intervention alternated each session between PECS and sign language. In this method of alternating treatments, the

participants may have generalized skills across treatment conditions; however, due to the small sample size, a more controlled experimental design (e.g., group comparison) was not feasible. Treatment was provided by thirteen different people to encourage generalization to new communication partners and to control for effects the examiner may have had on the child's performance. The children were taught to use PECS using the treatment protocol as designed by Bondy and Frost (1996), and this protocol was adapted to teach the children sign language as well. Data was collected on behaviour (e.g., tantrum, positive affect), communication strategies (e.g., looking, pointing, PECS, signs), and child characteristics (e.g., play skills). There was a high level of inter-observer agreement across all areas (85-100%) (p. 65-70). This study was carefully designed to control for many variables to ensure that the data collected were valid and reliable.

Some of the main results of the study are as follows:

- participants appeared to behaviourally prefer one modality over the other based on correct use and maintenance levels at post-treatment
- benefits of the PECS modality included success with a broader range of children, faster rates of acquisition and better generalization to novel items
- benefits of the sign language modality included higher levels of spontaneous initiation, eye contact and vocalization at post-treatment (p. 100)

Additionally, Anderson provided information regarding individual child characteristics affecting preference of one intervention over the other. Specifically, success with PECS was associated with the child's pre-treatment level of joint attention, while success with sign language was associated with language comprehension and functional play.

As previously noted, statistical analyses were not conducted, so all outcomes were determined subjectively. This study provides valuable information regarding benefits of each language intervention and individual characteristics which may indicate which treatment may be more successful.

Tincani (2002) also conducted a study to compare PECS and sign language, as reported in his PhD dissertation. The participants in the study were four children aged 5;10 to 11;5 years with multiple disabilities including autism. They

were selected for this study due to their lack of functional communication to request. It should be noted that only three of the four students had a diagnosis of autism, whereas the fourth had agenesis of the corpus callosum, which is "commonly associated with mental retardation and seizure activity" (p. 33). Participants had varying levels of previous experience with PECS, sign language or both, which may have influenced their performance throughout the study. Training sessions were provided only by the experimenter, which creates the possibility of experimenter bias in the administration of treatment. The setting of the training sessions changed over time for some of the students. Although this provides information on generalization of skills across environments, it would be ideal to have all participants experience the same changes in environment. The study's dependent variables were hand fine motor imitations, mands (i.e., requests), and vocalizations, with pre-treatment baseline assessments of communication skills, motor imitation, and preferred stimuli. Data collection was conducted by the primary researcher for all sessions, and by a second trained observer for 26.3% of all sessions to ensure inter-rater agreement for the observed behaviours. The study used an alternating treatments design for two of the students, with an initial baseline and final "best treatment" phase. The treatments sessions were balanced over days of the week, time of day and order of stimuli to control for variables other than treatment effects. The remaining students were trained to use PECS and sign language in an A B C D design (i.e., A- baseline, B- first modality, C- second modality, D- best treatment phase, with the first modality taught alternating across students). The change in experimental design was to account for inherent weaknesses in the alternating treatments design. However, it also creates difficulty in reporting the results of the study accurately, as there are two different methods of treatment conditions being conducted. Data were presented throughout the paper in graphs which corresponded accurately to the reported results.

The main results of the study are as follows:

- most students used PECS to initiate requests more frequently than sign language.
- students with better motor imitation skills acquired sign language more easily.

- One student appeared to behaviourally prefer sign language, while another preferred PECS. The remaining students (n= 3) did not show a preference for either communication modality.
- Students who developed the use of vocalization did so more with sign language than PECS (n= 2).
- The student with agenesis of the corpus callosum did not develop independent requests in either modality.

Although there are some limitations in the design of this study, it provides information about individual child characteristics which may affect communication outcomes when using PECS and sign language.

In 2004, Tincani conducted a small study comparing development of mands (i.e. requests for preferred items) in children with autism when using PECS and sign language. The participants in the study were two children with autism who were non-verbal and whose primary mode of communication was gesture. The study used a single subject, alternating treatments design, with an initial baseline period and a final “best treatment” period, where each student continued treatment with their “best” modality (i.e., PECS or sign language). The students were given an initial assessment to determine stimulus preference, imitation ability, and a baseline measurement to ensure that the children were not already able to use PECS, sign language or verbal requests. The students were trained to use PECS and manual signs with high-interest items as determined by the stimulus assessment. The training procedure for each modality involved presenting a stimulus item and modeling the desired response with increasing time delays and reduced levels of prompting. Generalization probes were conducted to determine the level of generalization of the use of PECS and sign language with different communication partners (e.g., the classroom teacher). The dependent variables measured in this study were motor imitation, independent mands, and word vocalizations. To ensure accurate data collection, the study used multiple observers to measure the variables, and had an inter-observer agreement of 97%.

The study made good attempts to reduce confounding variables, by alternating type of treatments, time of day, order of presentation of items and communication partners. There were a few limitations in the

procedure of the experiment. The author stated that the stimulus assessment may not have been as thorough as desired, which could lead to presentation of stimulus items that were not motivating to the students. Additionally, the setting of the training sessions was inconsistent across participants, as sessions took place in the school, and were interrupted by school routines (e.g., varied teaching staff and daily schedules). Finally, the number of trials in each session was limited due to time constraints. Given the opportunity to have more extensive training in each modality, the participants may have achieved more positive communication results.

The main results of the study were reported as follows:

- one student had more success in spontaneously requesting desired items with PECS, while the other had more success with sign language, as determined subjectively by the researcher.
- Word vocalizations were noted to occur at a higher rate in sign language training for both students, however a modification in the PECS system was developed to increase vocalizations for one student (i.e., a delay of giving the requested item to the student). It should be noted that although the addition of the modification changed the experimental condition, it provided valuable information regarding a possible method to improve communication outcomes.

The study concluded that a major factor in the success of using sign language was motor imitation skills, and that although spontaneous vocalizations are more frequent in sign language, it is possible to achieve a similar level of vocalizations when adding a modification to PECS.

It should be considered that this was a very small sample, which necessitated the use of an alternating treatments design for each subject. Ideally, this type of comparison would be done with two groups, each learning a modality completely before switching. Additionally, the author chose to use only the “best treatment” for the final stage of the study. There may have been valuable insight into the comparison if both treatments were continued.

As with the previously discussed experiments, a detailed statistical analysis of the data was not conducted, however, data collection

procedures for the dependent variables were well-controlled and the results were adequately portrayed in graphs throughout the article.

Recommendations

Several recommendations can be made based on the current literature available. Clinicians must consider the individual characteristics which may affect communication outcomes when using PECS and sign language as a language intervention for children with autism. It is recommended that clinicians assess motor imitation to determine whether a child will be successful imitating hand signs. A training period for each intervention is advised, to determine which intervention provides the most success for an individual child, as we know that some children tend to show a behavioural preference for one over the other. It is also important to consider the desired communication outcome, as the literature shows differences between the two interventions (i.e., PECS is acquired more quickly, while sign language encourages more vocalizations). It may also be possible to increase vocalizations when using PECS, as described in Tincani (2004), which should be considered when determining which treatment program to implement.

Although these recommendations can be made with confidence based on the current literature, further research may continue to

provide valuable information to compare language outcomes in PECS and sign language. It is recommended that future studies have a larger sample size, and use a randomized controlled trial design. Standardized assessment tools should be developed to assist in determining which language intervention will be the most successful for an individual child. As seen from the results in the above noted research, characteristics which should be considered in future assessment tools include motor imitation, vocal imitation, play skills, joint attention, language comprehension and preferred stimulus items.

Conclusion

There are currently many language interventions for non-verbal children with autism, including PECS and sign language. Based on the current literature, it is known that individual differences may affect language outcomes when using these interventions. Overall, research shows that there are advantages and disadvantages to using each intervention, which should be considered carefully when determining which communication modality to implement. Further research may assist in developing assessment tools to determine which intervention is the most appropriate to help an individual child obtain communication outcomes.

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