Critical Review:
What Effect Does the Use of Augmentative and Alternative Communication have on the Language Development of Children with Childhood Apraxia of Speech?

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This critical review reports the published evidence examining the relation between the use of augmentative and alternative communication devices and language development outcomes in children with Childhood Apraxia of Speech. Studies examined include two single-subject designs and one case study. The information contained within these articles was evaluated for level of evidence, validity and importance using a critical appraisal template. Overall, results suggest that augmentative and alternative communication devices, particularly speech-generating devices, have positive effects on the language development of children with Childhood Apraxia of Speech; however, more comprehensive research in this area is needed.

Introduction

Childhood Apraxia of Speech (CAS) is a developmental speech disorder that involves difficulties with planning or programming the motor movements required for speech. The result is an inconsistent pattern of speech sound errors that ultimately has significant impacts on speech intelligibility (ASHA, 2007). Though CAS is itself a speech disorder, the language development in this population is often described as both 'delayed' and 'unique'. Children are often delayed in their onset of spoken words and experience a prolonged period of expressing multiple meanings through single words (Hall, Jordan & Robin, 1993).

Children naturally develop language by using it in communicative interactions. It logically extends from this that children who struggle to use language may struggle to develop it in this natural way; however, traditional intervention programs for CAS have focused solely on speech production. Intervention is typically both intensive and extensive and involves repetitive practice of speech sounds and sound patterns (Bornman, Alant & Meiring, 2001). Some children will develop natural speech through such interventions, but many children will continue to struggle to be proficient verbal communicators (Velleman & Strand, 1994).

According to Cumley & Jones (1992), "delayed language…[is a] high price to pay while either waiting for speech to develop naturally or while devoting 99% of the available therapy time to speech intervention" (as in Bornman et al., 2001, p 624). By targeting interventions solely on remediation of speech difficulties, these children are missing opportunities to develop their language (Bornman et al., 2001). They then experience further obstacles to their language development because their verbal language skills inhibit their ability to participate in the communicative interactions that help to develop language.

The purpose, therefore, of alternative and augmentative communication (AAC) for this population is to facilitate the communicative interactions that provide the foundation for language development. AAC "supplements" (Bornman et al., 2001) a child's limited verbal expression by introducing another method of communication. In doing so, the child's existing communication repertoire is expanded, thereby increasing his or her ability to participate in communicative interactions (Bornman et al., 2001).

Despite the fact that intervention targeted exclusively on speech can risk delays in language in children with CAS (Cumley & Jones, 1992 as in Bornman et al., 2001), such approaches continue to be the standard of care for this population (ASHA, 2007). Given that children learn language through communicative interactions and given that AAC can help increase the opportunity for, and success of, these interactions, there are reasonable grounds for incorporating AAC into intervention programs for children with CAS for the purpose of facilitating language development. There is, however, a paucity of evidence examining this relationship.

Objectives

The primary objective of this paper was to critically review existing literature related to the possibility of a link between the use of AAC and positive language development outcomes in children with CAS.

Methods

Search Strategy

Computerized databases including PubMed, CINAHL and Medline were searched using the following terms:

(augmentative communication) OR (alternative communication) OR (AAC) AND (child*) AND (childhood apraxia of speech) OR (apraxia of speech) OR (developmental apraxia of speech) OR (apraxia) AND (language)

Selection Criteria
Studies selected for inclusion in this review were required to measure or describe language outcomes in children with CAS who had used some method of AAC as part of their intervention. No specifications were put on the type of AAC method or device used.

Data Collection
Results of this search yielded three articles that met the selection criteria outlined above: two single-subject design studies and one case study.

Results

Single-Subject Designs
Single-subject designs are appropriate for less common disorders such as CAS. Because the use of AAC is not commonplace in this population, single-subject studies are necessary to build a convincing foundation upon which future research can build. Such designs are suitable methods for exploring a hypothesis; however, there are inherent limitations. Single-subject designs, by nature, do not allow comparison to a control group, and, by extension, make it impossible for researchers to be blind to the intervention. Furthermore, it is difficult to draw robust and generalizable conclusions from a single case.

Bornman et al. (2001) used a single-subject, ABA design to examine the effects of the use of a speech-generating device (SGD) on the language development of a 6;5-year-old boy with severe CAS. The intervention involved parent training in shared story contexts and included measures at baseline, after the two-week intervention and four weeks after SLP intervention withdrawal. Language-related measures focused on the appropriateness of the child's questions in relation to the difficulty level of the mother's questions. Results showed an increase in language development, as measured by the appropriateness of the child's answers to knowledge questions. Additional question/answer types were monitored, however, results were less clear.

The subject of the study was well described, including details of his medical history and his history of involvement with speech-language pathology services. Appropriate standardized measures were administered prior to the study to establish the child's language and cognitive functioning.

Full details regarding the procedure of the storytelling interactions and parent training used in this study were not provided, however, the measures used were thoroughly explained and clearly replicable. Acceptable inter-rater reliability was reported; however, no measures of intra-rater reliability were taken. Data was analyzed using descriptive statistics, which in some ways limits the analysis of change. Also important to note is that the subject's mother was highly educated, which may limit generalizability of this parent training to the general population.

The level of evidence offered by this study is suggestive that the use of an AAC by a child with CAS leads to improvements in language function.

Luke (2016) also used a single-subject design to examine the effectiveness of the use of a SGD on the language development of a 2;7-year-old boy with severe CAS. An AB design was employed over a treatment period of one year and three follow-up measures were completed at intervals of three months. Language-related measures included mean length of utterance (MLU), as well as number of words and word class distribution from spontaneous speech samples. Other measures of communicative competence not relevant to the current question were also taken but will not be discussed. Results showed significant increases across all language development measures.

The subject of the study was described in detail, including a case history and summary of current functioning on a number of levels. Gold-standard measures of both language and cognitive functioning were completed prior to the study. The study results could have been strengthened had these measures been repeated at the end of the study (an appropriate amount of time had passed to allow for valid re-testing).

Despite the inherent weakness of a single subject design as described, the methodology of this study was transparent and replicable and included several strengths. The extensive pre-treatment phase allowed for the establishment of a stable baseline. Change was measured at regular intervals using valid constructs of child language development and attempts were made to control for other factors that could have confounded results. Inter-rater reliability was reportedly extremely high. Data analysis was appropriate and allowed for interpretation of statistical significance.

This study provided somewhat compelling evidence that the use of an AAC device can lead to improvements on several measures of language function for a child with CAS.

Case Reports

Case reports are valuable for specific questions regarding rare disorders, such as CAS. As with single-subject designs, case reports are by nature limited in their external validity. Subject selection is often opportunistic. This limits the ability to draw larger-scale inferences and generalize results to more diverse populations. Case reports can, however, provide a base that can give direction to future research.

Cumley & Swanson (1999) analyzed the effects of AAC device use on different outcome measures of three individuals in case study format. Language development was analyzed in one of these cases and therefore, only this case will be discussed in detail. The subject in this case was a 3;4-year-old girl with a diagnosis of CAS. The intervention involved implementation of several AAC devices (including paper-based and speech-generating devices). Constructs of language development, such as MLU, were measured in spontaneous samples. After six months of device use, results showed increased development in expressive language such that the child moved into the average range on a normal distribution curve. Conversational competence, a measure of social communication, was also measured but will not be commented upon further.

Though the authors used three cases, only one included measures of language development. The strength of evidence could have been improved by incorporating language measures into all cases in this series. The subject's medical history was described in detail and gold-standard measures of language functioning were used to describe her pre-treatment level of functioning. One limitation is that no testing was done to confirm the cognitive level of the child prior to the study.

The methodology of this study has several strengths. First, records from therapy prior to the study established a stable baseline. Second, outcome measures chosen were valid constructs of language and are commonplace in the literature. Finally, the AAC devices implemented and the ways in which they were implemented were described with sufficient detail to allow for replication. Data analysis allowed for a description of functional improvement; however, no analysis of significance of change was undertaken.

While the authors made several attempts to increase the strength of the evidence through methodological considerations, the level of evidence offered by this study is suggestive that language improvement can occur in a child with CAS through the use of an AAC device.

Discussion

Overall, the findings from the studies outlined above indicate that AAC devices are an effective method for promoting language development in children with CAS in the subjects described over short intervention periods.

Given, however, that all studies explored here involved only a single subject, it would be pre-emptive to draw more robust conclusions. Limitations in data analysis undertaken in these studies made it difficult to interpret the significance of gains. Furthermore, no longitudinal data was collected to support or deny the maintenance of improvements over longer terms. Therefore, despite some suggestive and compelling evidence provided, conclusions cannot be drawn beyond the subjects described.

Furthermore, the measures of language development used (or ways in which they were used) differed substantially between studies, making them difficult to compare to one another. The AAC devices used also differed across studies and, although this speaks to the need to tailor the device to the child, renders comparison difficult.

Finally, it is important to note that, due to the nature of the subject area, it is not possible to complete a true "ABA" design intervention where the subject returns to the initial, device free baseline condition. It is not ethically feasible to remove the device from the child once implemented as part of the intervention; therefore, ABA designs of this type can only include a withdrawal of therapeutic support by the SLP.

Future Research Considerations

It is recommended that further research be conducted to confirm the effectiveness of the use of AAC to promote language development in children with CAS. Most notably, it is important to determine whether the improvements outlined in these studies will generalize to the broader population of children with CAS and whether the improvements made are sustainable over longer terms. In future studies in this area, the following recommendations should be considered to strengthen the level of evidence:

a) The prevalence of language impairment in the population of children with CAS should be explored and described.

b) Cognitive level should be measured prior to the initiation of an intervention to ensure that treatment results are not biased or confounded by enhanced or diminished cognitive level.

c) Study designs with large sample sizes should be used to determine the generalizability of findings.

d) Study designs employing a control group should be used to help control for any confounding factors that may be unidentifiable in a single case, especially given the inability to complete a true ABA design (due to the unethical nature of withdrawing a device once prescribed).

e) Standard measures of language development should be used to allow for comparison among individuals and across studies.

f) Data analysis should include methods of determining statistical significance to allow for appropriate interpretation of results.

g) Follow-up measurements should be completed to determine if improvements are maintained over longer terms.

Clinical Implications

Due to the somewhat suggestive strength of evidence, it is recommended that clinicians be cautious in interpreting the results of these studies and in implementing these results into clinical practice.

Although the strength of evidence provided by the articles reviewed here is by nature suggestive, these studies provide an important foundational basis to direct future research. The current standard of care for CAS does not include therapy directed at promoting language development (ASHA, 2007). Taken together, these studies provide suggestive evidence that language development can be of greater concern in this population and that AAC devices could provide an effective means of remediating or preventing difficulties in this area by compensating for lack of oral language.

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