

*\* This paper was created as a required assignment for the CSD9639 Evidence Based Practice for Clinicians course at Western. While it has been evaluated by course instructors for elements of accuracy and style, it has not undergone formal peer*

key terminology: [(Childhood apraxia of speech) OR (apraxia) OR (apraxia of speech)] AND [(AAC) OR (augmentative and alternative communication) OR (speech generating devices) OR (intervention) OR (treatment)].

Additional related studies were obtained from the reference lists of previously searched articles. No limits were placed on this search.

Selection Criteria: The studies selected for inclusion in this critical review were required to include children (under 18 years old) with CAS. Studies were required to use AAC and investigate the efficacy of these strategies in improving the communicative abilities of children with CAS.

Data Collection: The results of this literature search yielded six articles congruent with the selection criteria. The articles consisted of five single-subject designs and one case study. All studies investigated the use of AAC as a tool for facilitating the development of the communicative abilities of children with CAS.

## ***Results***

### **Single-subject Design**

Single-subject research designs can be considered high-level evidence designs since they involve participant(s) being exposed to control conditions in addition to treatment conditions. In these designs, the participants are able to act as their own controls. If these studies lack randomization or blinding of examiners, the strength of these designs decrease (Logan, Hickman, Harris & Heriza, 2008). This type of design is especially appropriate when examining children with CAS because it is such a heterogeneous group.

Luke (2003) conducted a longitudinal single-subject design that examined the effectiveness of speech generating devices (SGD) at improving the communication and language abilities of a boy aged 2 years, 7 months with severe CAS. Results of this study indicated that upon introduction of the SGDs, an immediate increase in the communicative development (i.e., means of communication) was observed. Additionally, data indicated improvements in all linguistic variables



with CAS. Results of the study indicated that introduction of the SGD assisted in facilitating communication and language development, specifically with regards to higher cognitive language functioning, in a child with CAS.

Bornman et al. (2001) conducted a baseline measurement A1 that mother telling her son a story using the Macaw. A second baseline measurement A2 was also taken which followed a similar trajectory, contained the same overlay, however the Macaw was pre-programmed by . Following baselines measures, intervention began targeting the use of the Macaw to increase the cognitive demands placed upon the participant when being faced with questions and answers regarding narratives. Following training, a post-training baseline measurement (B) was taken using the same story from A2. Four weeks post intervention the post-withdrawal evaluation (A3) was completed. Bornman et al., (2001) did report on the fact that this story was more cognitively challenging than the story used in A1.

Data regarding *level/frequency of questions, appropriacy of answers, primary communication modality, and frequency of initiation attempts* were collected at both of the baselines (A1 and A2), post-training evaluation baseline (B), and post-withdrawal evaluation (A3). Transcriptions of the audio recordings used to gather and track data was useful in highlighting the questions that were asked to the child, as well as the answers he provided. Additionally, video recordings were used to analyze the primary communication modalities.

according to the mother: *Level 1 Knowledge, Level 2 Comprehension, Level 3 Application, Level 5 Synthesis, and Level 6 Evaluation*. Results of the study indicated that the AAC device was useful in facilitating communication and language development. Increases in AAC use, in addition to subjective gains with regards to spoken communication were observed. The percentage of *no opportunity to answer* and *inappropriate responses* sharply declined and a greater variety of responses was observed in post-training measures. In turn, an increase

communicative modalities, and attempts was also observed. Child verbalizations, gestures, use of the Macaw, and frequency of initiation attempts increased. Additionally, the authors reported that when the participant was intelligible during interactions with a communicative partner, verbalizations decreased and the use of the SGD increased. An increase in the cognitive complexity of questions, variety, and frequency of questions directed at the child was seen.

Bornman et al. (2001) did report on a questionable result from the study. As the use of the SGD increased throughout the intervention period, verbalizations decreased. Researchers reported that this finding was unexpected since AAC was not intended as a replacement for natural speech. Additionally, the authors acknowledged that due to the small sample size the external validity of the study was restricted, which limited generalizability.

Despite the previously mentioned limitations, a thorough assessment was conducted by Bornman et al. (2001), using appropriate pre and post-intervention, multiple baselines (A1 and A2), and clear, detailed explanations were provided regarding candidacy for a SGD, the areas of language that were examined, and how the data were collected (i.e., audio and video recordings, verbatim transcriptions), making the study easier to replicate. The authors also provided thorough suggestions for future research hypothesis in this area. Inter-rater reliability was a strength in this article as the author reported inter-rater reliability of 82.8% for A1. Additionally, two raters scored A2, B, and A3 and a 100% correlation was reported.

AAC device. Additionally, the participant was seen twice a week by the research SLP or research special education teacher. The treatment consisted of four components: narrative writing,



dictionary, and a remnant book. At 8 years, prior to the start of traditional speech and language services, the participant was administered the *Hodson Assessment of Phonological Processes-Revised* (Hodson, 1986), in which she received a phonological deviancy score of 100 and a severity interval of profound. Following six months of speech therapy, a post-test measure was obtained revealing minimal progress. It was at this time a multimodal AAC intervention approach began.

### Study #3

The third participant was a junior high boy who was provided with high and low tech AAC aids (i.e., memo writer and communication boards) to support his natural speech in different environmental settings (i.e., classroom and community). This participant was the only individual to receive both an AAC assessment in addition to a functional communication assessment. AAC assessment focused on the assessment of spelling and the use of a Sharp Memo Writer was suggested to support his communication needs. The functional communication assessment included the Functional Motor Speech Questionnaire, FMSQ, (a modification of the Communication Profile Questionnaire for Speakers with Motor Speech Disorders), which was completed by the participant himself, by the school personnel, and his parents.

communicative attempts, specifically his strategies to repair communicative breakdowns. Since informal observations are subject to biases, this information should be reviewed with caution. However, Cumley and Swanson (1999) supported the informal observations by calculating percentages of agreement between those who completed the FMSQ. Results suggested that within the classroom, beneficial in supporting his natural speech for a variety of communicative functions: setting topics, requesting, and expression of thoughts and ideas.

Results of this study should be evaluated with caution. Firstly, the small sample size results in a lack of external validity and limits generalization to larger populations. Secondly, for all three studies there was inadequate, limited, detail regarding inclusion criterion for participants and means in which results were obtained. Additionally these studies did not gather enough quantitative data. Study 1 provided data regarding a 50-word pre- and post-test assessment measuring MLU. Study 2 administered a standardized test, which examined phonological processes before and after traditional therapy but did not provide data following the implementation of AAC. Study 3 only provided data for the percentages of agreement among those who completed the Functional Motor Speech Questionnaire, which is at risk of subjective biases. Since all three articles are case studies, any gains

observed cannot be confidently attributed to treatment. While researchers provided information for further research, they failed to acknowledge any limitations within their own study. As a result, this study provides equivocal level IV evidence regarding the effectiveness of a multimodal AAC intervention approach in facilitating natural speech in children with CAS.

### *Discussion*

This critical review discusses the efficacy of AAC in improving the communicative abilities of children with CAS. All six studies reported positive gains in the communicative abilities (e.g., increases in natural speech, initiating, requesting, offering information, MLU, intelligibility, vocabulary, etc.) of all participants following the use of AAC. However, some studies provided more suggestive evidence than others. The use of stable, multiple baselines and thorough descriptions regarding participant candidacy for AAC and data collection methods, provided suggestive evidence for the studies conducted by Bornman et al. (2001) and King et al. (2013).

A-B study design was





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