

designed communication boards for receptive and expressive language.

The authors provided examples of the types of symbols used on both communication boards as well as information on the frequency and duration of the training. This allows for replication of this particular intervention.

AAC intervention the authors stated that tape recorded conversations, informal notes and tallies by both the therapist and family members on the use of receptive and expressive symbols were taken; unfortunately, this data was not reported in detail. The authors concluded that this client successfully learned how to use both communication boards, with some situations providing greater success than others (e.g., when used with familiar listeners). It was also stated that the client used more complex messages and took more communicative turns when he used the communication boards.

Overall, the authors stated that there was good potential for using visually based AAC strategies for individuals with PPA based on the increase in functional communication for both of these clients. However, clear outcome measures of both AAC interventions were not provided; therefore, the

conclusions from this study cannot be determined.

Single-Subject Experimental Studies

Similar to case studies, single-subject experimental studies are also useful in studying rare and heterogeneous populations such as PPA. This type of design allows researchers to study the effects of a specific treatment on a client. Also similar to case studies, these types of studies lack external validity; however, the strength of evidence is slightly higher as the client is a part of an experimental study that yields data which can be used to support conclusions and interpretations.

Murray (1998) conducted a 2.5 year longitudinal single-subject experimental design study that focused on an evolving treatment regime for a 64-year-old woman with non-fluent PPA. Within this intervention, three different therapy approaches were used: 1) a traditional stimulation-facilitation program (Helm-Estabrooks & Albert, 1991); and 3) a functional communication approach which included provision of an AAC device.

The author provided specific details on the therapy materials, therapy procedures as well as the

frequency and duration of all therapy approaches making replication possible. In addition, the author reported results from standardized language assessments completed throughout the duration of the study as well as direct outcome measures linked to each therapy approach; a good description of the

included.

An additional strength of this study was in the treatment designs. Specifically, two therapy approaches were implemented in multiple block treatments, which allowed for replication of treatment effects. In comparison to the single block treatment approach), this design provided additional information on the carryover of skills between treatment blocks. It allowed for the client to be her own control and illustrated the level of her communication skills both with and without treatment, thus clearly indicating the impact of these therapy approaches.

The raw data from both formal and informal pre- and post-treatment measures relevant to each therapy approach were reported, thus increasing confidence

both qualitative and quantitative methods. The quantitative statistical analyses involved pairwise *t*-tests on the pre- and post-treatment measures in only one of the treatment approaches. The remaining quantitative data collected was analyzed using visual inspection by the author. Both types of analyses were considered appropriate given the nature of the data collected.

The author provided results from a qualitative

information was provided on how this analysis was completed, limiting confidence in the accuracy of the f the qualitative data.

The lack of reported reliability values in this study made it difficult to determine if the data was collected in an unbiased manner. This added the limitation of experimenter bias in both the data collection and analysis phases of this study.

Overall, this study provided detailed descriptions of three therapy approaches used for an individual with PPA. Although there were some limitations to this study, it provided a fair degree of evidence in support of the benefits of long term speech-language pathology services for individuals with PPA.

The data was analyzed through visual inspection by the author; therefore, no statistical significance was reported. In addition, nine graduate students were

pre- and post-treatment responses, which eliminated some of the experimenter bias from the study.

The authors included the rating scale that was used for the client to evaluate preference of communication method; however, the raw data from this rating scale was not included. Therefore, the statement that this client responded much better to the ASL communication method based on personal preference was not supported by any data.

Overall, based on the limitations mentioned above, this article provided a fair level of evidence on the use of alternative communication methods for individuals with PPA. This study also raised awareness that personal preferences may play a role in determining which intervention method will be successful for individuals with PPA.

Discussion

All of the studies reviewed in this paper target speech and language therapy on adults with PPA; however, the specific focuses within these studies are very different. All of the studies report some benefit to the

intervention. However, the strength of evidence from these studies is limited due to a number of methodological limitations. Firstly, there are concerns regarding sample size and participant selection. Each study has only one participant, or the participants are presented as separate cases (e.g., Cress & King, 1999). Also two of the studies (Rogers & Alarcon, 1998; Pattee et al., 2006), involve participants that have both PPA and AOS, rather than a pure case of PPA. These factors limit the generalizability of the findings from these studies to adults with PPA as a group.

Another methodological limitation found within these studies was the lack of statistical analyses. With the exception of the Murray (1998) study where a pairwise *t*-test was reported, no statistical analyses were reported. The visual inspection of data for analysis purposes was appropriate given the nature of the data in some of the studies; however, in others (e.g., McNeil et al., 1995; Schneider et al., 1996) it was not clear why statistical analyses had not been performed. When pre- and post-treatment measures are reported, it is difficult to determine if there is a significant effect of treatment without statistical analyses.

Also, in the case studies (Cress & King, 1999; Rogers & Alarcon, 1998), no specific data were reported, thus the impact or success of treatment was based solely on self-reports. This makes it difficult to determine the impact of these interventions as the authors may have been biased.

There are also advantages to this type of research. All of the studies, with the exception of one (Pattee et al., 2006) provide detailed descriptions of the clients case history. This allows for clinicians to use these studies for informational purposes with similar clients.

In addition, the study by Rogers and Alarcon (1998) suggested that standardized tests did not accurately reflect short-term language declines in PPA. They suggested the use of informal measures such as MLU and CIUs from language samples were more appropriate. These informal measures were used in other studies to measure treatment effects (McNeil et al., 1995; Schneider et al., 1996; Rogalski & Edmonds, 2008; Pattee et al., 2006) indicating that this is one effective way to measure language ability in PPA.

Overall, the evidence from this critical review is suggestive. In order to strengthen the level of evidence future research considerations in this area should include larger sample sizes matched for various characteristics (e.g., type of PPA, time since diagnosis, age, gender) and study designs that incorporate statistical analysis.

Clinical Implications

Due to the limited strength of evidence provided from the reviewed articles, clinicians should be cautious when implementing the findings from these studies into practice. However, this review shows that there are many different interventions that can help maintain speech and language skills in individuals with PPA. Clinicians should be aware that treatment within a rare and heterogeneous population such as PPA may require an eclectic approach as effective strategies may vary between individuals. Also, the focus of therapy may have to change over time as the needs of the individual change; thus, therapy should be long term to accommodate for these changes. In addition, the success of a speech and language intervention is dependent on the individual's cognitive status, goals, and motivations.

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