

Critical Review: The effectiveness of script training intervention on the rate of speech and percentage content use in the speech of persons with chronic, non-fluent aphasia

Jodi Anderson
M.Cl.Sc (SLP) Candidate
University of Western Ontario: School of Communication Sciences and Disorders

This critical review examines the effectiveness of script training intervention with individuals with chronic, non-fluent aphasia with respect to improved rate of speech and percentage of script-related content words used. Study designs include: delayed treatment, multiple baseline, single subject study designs and a qualitative study. Overall, the results indicate that script training intervention produces improvements in the rate of speech and percentage of content words used in the everyday communication of individuals with aphasia. In addition to these results, findings show that generally more intensive therapy and practice of the scripts lead to greater changes in the participant's language use.

Introduction

Aphasia is an acquired disorder affecting speech and language caused by damage to the language centers of the brain, often a result of stroke or traumatic brain injury; most commonly in aphasia, the damage specifically occurs in the left cerebral hemisphere. Aphasia can affect the expressive and receptive components of language as well as reading and writing, and varies in degrees of severity. In conjunction with the effects on language skills, aphasia affects the social aspect of the lives of those living with it; specifically, aphasia can lead to social isolation and reduced participation in life activities (Bilda 2012, Mackie-Simmons 2010).

Speech-Language therapy for individuals with aphasia has predominantly focused on single aspects of language recovery, such as word finding and naming. Recently, however, a more functional approach to treating the language skills of persons with aphasia has been adopted. These functional approaches often lead to high motivation of the individuals and greater generalization to their everyday communication (Cherney, Halper & Kaye, 2011). Evidence has also shown that more intensive treatment produces greater and longer-lasting changes in the communicative skills of individuals with aphasia (Cherney, 2012; Goldberg, Haley & Jacks, 2012).

Script training therapy is an intensive, functional approach to treatment for aphasia that combines services of a Speech-Language Pathologist with home-based practice, often involving the use of a computer-based program (Bilda 2011, Cherney & Halper, 2008; Youmans, Holland, Munoz & Bourgeois, 2005). Clients, along with their SLP and use of the computer program, develop, practice and use personalized scripts relevant to their communicative

environments. This type of therapy has demonstrated improvements in verbal output, grammatical productivity, rate of speech, articulatory fluency and communicative confidence in persons with chronic, non-fluent aphasia (Cherney et al. 2011; Goldberg et al. 2012). This review will investigate the effectiveness of script training in the communicative outcomes, specifically rate of speech and content use, in individuals with aphasia.

Objectives

The primary objective of this critical review is to examine the effects of script training intervention on the rate of speech and percentage use of content words in the verbal output of individuals with chronic, non-fluent aphasia. The secondary objective is to propose evidence-based clinical implications for this type of therapy.

Methods

Search Strategy

Computerized databases, including CINAHL, PubMed, ProQuest Dissertations & Theses and SCOPUS, were searched using the following search strategy:

[(aphasia) AND (script training)] AND [(rate of speech) OR (content)] AND [(aphasia therapy) AND (script training)] AND [(rate of speech) OR (content)]

The search was limited to articles written in English between 1985 and 2013.

Selection Criteria

Studies selected for inclusion in this critical review paper were required to examine the effects of script training intervention on the rate of speech and

percentage of script-related content words used in the verbal output of individuals with chronic, non-fluent aphasia. The only limits set on the demographics of research participants were that individuals have chronic, non-fluent aphasia; some studies included in this review did involve participants with fluent aphasia, however, this is taken into consideration when evaluating the results.

Data Collection

Results of the literature search yielded the following types of articles coinciding with the selection criteria mentioned above: single subject multiple baseline treatment design (4), multiple baseline delayed treatment design (1) and qualitative study (1).

Results

Bilda (2011) used a single subject design study to investigate the positive outcomes of video-based script training for aphasia to improve use of script-related words. Participants (4 non-fluent, 1 fluent) developed and practiced twenty personally relevant scripts selected from a pilot study using 60 healthy age-matched speakers over 10 days with 3 hours' daily therapy. Measures were taken at pre-test, post-test and follow-up evaluations at 4 weeks and 6 months.

Appropriate nonparametric analyses of baseline and follow-up measures on both trained and untrained scripts revealed significant improvements in the production of target phrases in dialogue. These improvements remained stable at both follow-up assessments; thus, providing some indication for generalization of these language skills (Bilda, 2011).

Qualitative results revealed participants and their partners reported increased confidence and greater overall participation in everyday communication and social interactions.

The two week intensive period of training and practicing scripts produced positive improvements in the language skills of the participants, however, it would be interesting to examine the outcomes after a longer period of script training considering the number of scripts used. A blinded method was taken in this study with one research assistant having performed the assessments while the other having carried out the training (Bilda, 2011). Improvements demonstrated through the evaluation of language skills on comparable non-trained scripts provides evidence for generalizability of script training for aphasia.

Given the strong methodology and design, this case series study provides Level 1 evidence. The significant improvements in the language use of the participants, including the stable results at follow-up assessments, provides compelling evidence for the use of video-based script training for aphasia.

Cherney and Halper (2008) studied the effects of script training intervention with three individuals with chronic aphasia (2 non-fluent, 1 fluent) in a multiple baseline design. The entire intervention lasted 16 weeks, during which time the participants met with the SLP weekly, developed and practiced three personally relevant scripts over the course of three weeks, and were instructed to practice on the home-based computer program for 30 minutes per day. Baseline, post-treatment and follow-up assessments included measures of language and quality of life. Measures of content pertinent to this review include number and percent of script-related words used and rate of speech.

Analysis of baseline and final scripts of both participants with non-fluent aphasia revealed no statistically significant changes in rate of speech or script-related content words (Cherney & Halper, 2008).

Various factors in both methodology and population play a role in the results. The participants in this study had concomitant cognitive deficits, which were difficult to control for, that may have affected the results. In addition to this, it is expected that consistency in intensity and practice time would yield less variability in results across participants. The participants with non-fluent aphasia demonstrated positive changes in rate of speech and words used in two of three scripts, however, these changes were not statistically significant (Cherney & Halper, 2008).

Overall, this study provides Level 1 evidence based on the single subject multiple baseline design of the study. The evidence is equivocal, however, based on the above-mentioned limitations suggesting that these results be regarded with caution and future research.

Youmans, Holland, Munoz & Bourgeois (2005) examined the effects of script training in the automaticity of speech regarding naturalness and stability of speech, increased rate of speech and correct script content production in two people with chronic non-fluent aphasia using a multiple baseline design. Each participant developed and trained three personally relevant scripts with the SLP over 30-45 minutes sessions three times weekly with at least 15 minutes of home practice a day. Baseline, maintenance and generalization measures of production on untrained scripts and administration of the Western Aphasia Battery were taken (WAB; Kertesz, 1988).

Reliability and social validity measures were taken to ensure accuracy as well as consistent measurement of dependent variables to assess the effectiveness of script training on production. Transcripts were tested for reliability of errors, speaking rate and correct production of scripts by independent coders; results indicate both speaking rate and percentage script correct were in high agreement for

both participants. Outcomes were measured by calculating percentage script correctly used with results indicating consistent improvements from baseline to 98-100% accuracy at the end of training and to 80-100% accuracy in the generalization contexts (Youmans et al., 2005).

Statistical analysis showed significant improvements in both participants on ratings of speech naturalness, increased rate and informativeness (Youmans et al., 2005).

Overall, these results indicate that script training improves speech production for relevant, contextualized topics with respect to rate of speech, percentage correct script production and naturalness in communication with evidence suggesting generalization for everyday communication. This study provides compelling Level 1 evidence for the effectiveness of script training intervention for individuals with chronic non-fluent aphasia.

A qualitative, delayed treatment design study by Cherney, Halper & Kaye (2011) displayed emerging themes resultant of computer-based script training over the course of nine weeks for adults with chronic aphasia (15 non-fluent, 8 fluent). Standardized language assessments including the WAB and the Burden of stroke Scale were administered at baseline, pre-treatment, post-treatment and at 6 weeks follow-up. Interviews were also conducted with the participant and/or significant other at the post-treatment assessment.

Emerging themes from the interview findings include significant reported changes in communication behaviors such as changes in verbal communication, improved communication skills in other modalities, changes noticed by others and increased communicative confidence. Participants and significant others also commented on improved speech rate and overall fluency, which led to increased communicative success and confidence. Comments regarding the use of script-related words in everyday social contexts indicates both correct script use as well as generalization to real-life communicative situations. The comments made by significant others enriched the results as individuals with chronic aphasia have varying difficulties expressing themselves (Cherney et al., 2011).

This qualitative study illustrates rich outcomes of script training intervention pertinent to the communicative lives of those living with aphasia. These results are indicative of improvements in the quality of life of these individuals as a product of script training intervention. The nature of the qualitative study provides Level 4 evidence; however, given the strong outcomes presented in the interview results, this study provides compelling evidence for the effectiveness of computer-based script training for aphasia.

Lee, Kaye and Cherney (2009) investigated the relationship between the intensity of treatment and the amount of improvement when using conversational script training. In this study, 17 participants with non-fluent aphasia practiced three individualized conversational scripts for 3 weeks each.

Amount of improvement was measured by comparing pre-treatment and post-treatment script performance in both rate of speech and script-related content words. Content was defined as the percentage of words spoken by the participant that were in the target script; rate was defined as the number of the script-related words spoken per minute.

Results show improvement in rate and content for all participants as well as correlation between amount of treatment and degree of improvement. Significant improvements in content in participants with more severe aphasia and significant correlation with improvement in rate in participants with less severe aphasia were seen when sample was divided into two groups based on WAB severity scores. Participants with lower WAB scores tended to practice more, leading to greater gains in content use (Lee et al., 2009).

This study produced strong Level 1 evidence for the positive effects of intensive script training in improving rate of speech and use of script-related content words in individuals with chronic, non-fluent aphasia. Individual factors such as the severity of aphasia and amount of time spent practicing the scripts impact the degree of improvement, however, significant changes were seen in all 17 participants.

Goldberg, Haley and Jacks (2012) studied script training intervention in two individuals with chronic non-fluent aphasia using standard multiple baseline design procedures. Each participant developed personalized scripts useful for everyday communication. Baseline probes were taken by audio-recording the independent production of each script by the participants prior to beginning the treatment, maintenance and generalization phases.

Audio-recordings of independent script production serves as probes throughout the study, and were analyzed for rate of speech and use of script-related words. Both participants demonstrated significant improvements from the baseline to maintenance phases for both rate of speech and use of script-related words.

Based on standards from single-subject design studies targeting aphasia treatment, the effect sizes determined in this study were as such (Robey, 2004): the effect size for use of script-related words was large for participant 1 and small for participant 2 while the effect sizes for rate of speech were large for both participants (Goldberg et al., 2012).

Although there were individual differences in rate of speech and content words used between the

participants prior to beginning treatment and during the maintenance and generalization phases, it is important to note that both participants showed improvements in these variables upon completing the script training intervention. As well, these improvements remained consistent throughout the maintenance and generalization phases. Based on the results of this two single-subject design, this study provides compelling Level 1 evidence for the effectiveness of intensive script training intervention for individuals with aphasia.

Discussion

The evidence from these six studies demonstrate that script training intervention for aphasia is effective in increasing the rate of speech and the percentage of script-related words used. The results of each study showed improvements in the above-mentioned features as well as others areas of communication.

Within each study, certain limitations were recognized, however, they did not overpower the improvements seen in the participants. The degree to which improvements occurred depended on various conditions, including the severity and type of aphasia, the amount of time spent practicing the scripts, and the individuality of each participant. The majority of the studies under review used similar methodology in that the participants developed relevant scripts with their speech-language pathologist and practiced for numerous weeks with measures taken at various times throughout the treatment (baseline, pre-, post- and follow-up/maintenance). Although there were differences between the studies in terms of the intensity of intervention, practice spent on each script and which measures (WAB, Burden of Stroke Scale, QOL scale, etc.) were used to track progress, the similarity between methodologies used increases the robustness of the findings.

With respect to this critical review, the increases seen in both rate of speech and percentage of content words used provide evidence for the effectiveness of script training for individuals with chronic, non-fluent aphasia. The improvements in rate of speech reflect positive changes in fluency and naturalness of speech (Bilda, 2011; Lee et al., 2009). The increased amount of script-related words used both in production of the scripts and in other contexts demonstrates improvements in vocabulary, word finding and memory. Regardless of the varying degree of improvement, these results indicate positive changes in the communicative functions of those with aphasia.

In addition to improvements in the rate of speech and the percentage of content words used by the participants, other important trends emerged from these studies. As demonstrated by the use of script-related

words in other communicative contexts, the results of these studies provided evidence for generalization of these skills to real-life contexts (Bilda, 2011; Goldberg et al., 2012; Youmans et al., 2005). The more functional approach to therapy that script training lends itself to strives to produce positive changes in the social communication of those with aphasia, which has been seen in each of the studies examined for this review.

Another important theme that surfaced throughout this review was that of increased communicative confidence and social participation of the participants (Cherney et al., 2011; Goldberg et al., 2012; Youmans et al., 2005). These positive changes were noted by both the subjects and their significant others.

Conclusion

Overall, the conclusions of this review are that script training intervention is an effective, functional approach to increasing the rate of speech and the percentage of script-related words used by individuals with aphasia. In addition to these improvements, positive changes were seen in the overall communicative confidence and effectiveness of the individuals. These changes in verbal communication lead to increased motivation, confidence and participation in everyday social interactions, areas in which are greatly impacted by aphasia.

Clinical Implications

Script training takes a functional approach to treating the language skills of individuals with aphasia. While traditional approaches to aphasia therapy focus on improving specific language skills, these studies provide evidence supporting the use of a more functional approach to doing so. Script training intervention utilizes relevant, everyday communicative contexts to improve the verbal language skills of individuals with aphasia.

Using the computer-based program in conjunction with services of a speech-language pathologist is a cost-effective avenue to treatment. The individual practice time on the computer lends itself to increased motivation and confidence of the users combined with the lessened burden of cost compared to traditional therapy. The development, practice and use of personalized scripts relevant to each individual also increases the likelihood of generalization of language skills.

Improvements of language skills resultant of script training intervention include increases in verbal communication skills, such as increased rate of speech and percentage of script-related words used in conversation, communicative confidence and social

participation. As evidenced in this review, script training intervention produces significant improvements in the areas of communication affected by aphasia. .

References

- Bilda, Kerstin (2011). Video-based Conversational Script Training for Aphasia: A therapy study. *Aphasiology*, 25 (2), 191-201.
- Cherney, Leora R. (2012). Aphasia treatment: Intensity, dose parameters, and script training. *International Journal of Speech-Language Pathology*, 14 (5), 424-431.
- Cherney, Leora R. & Anita Halper (2008). Novel Technology for Treating Individuals with Aphasia and Concomitant Cognitive Deficits. *Top Stroke Rehabil*, 15(6), 542–554.
- Cherney, Leora R., Halper, Anita S. & Kaye, Rosalind C. (2011). Computer-based script training for aphasia: Emerging themes from post-treatment interviews. *Journal of Communication Disorders*, 44, 493-501.
- Goldberg, S., Haley, Katerina L., & Jacks, Adam (2012). Script Training and Generalization for People with Aphasia. *American Journal of Speech-Language Pathology*, 21, 8, 222-238.
- Kertesz, Andrew (1988). Western Aphasia Battery. Retrieved from:
<http://www.pearsonassessments.com/HAIWEB/Cultures/en-us/Productdetail.htm?Pid=015-8440-862>
- Lee, Jaime B., Kaye, Rosalind C. & Cherney, Leora R. (2009). Conversational script performance in adults with non-fluent aphasia: Treatment Intensity and aphasia severity. *Aphasiology*, 23 (7-8), 885-897.
- Simmons-Mackie N, Raymer A, Armstrong E, Holland A, Cherney L. (2010) Communication partner training in aphasia: a systematic review. *Arch Phys Med Rehabil*, 91:1814-37.
- Youmans, Gina, Holland, Audrey, Munoz, Mariah & Bourgeois, Michelle (2005). Script training and automaticity in two individuals with aphasia. *Aphasiology*, 10 (3/4/5), 435-450.