

Critical Review:
Is webcam-based delivery of fluency intervention effective for the treatment of stuttering?

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This critical review examines the efficacy of webcam-based fluency intervention that is delivered through audio-video conferencing. Five articles were assessed in total. The study research designs consisted of two single subject designs and three expert opinion pieces. Overall, evidence suggests this service delivery method has potential to be an effective alternative to face-to-face delivery. The results of this review indicate that clinicians should be cautious of the implementation of this type of program, and only do so after careful consideration of individual client variables. Challenges and limitations of research, and future recommendations are discussed.

Introduction

Guitar (2006) states that stuttering or disfluency is characterized by an abnormally high frequency and/or duration of stoppages in the forward flow of speech. The three main components of stuttering are core behaviours (repetitions, prolongations and blocks), secondary behaviours (hand tapping, eye twitching etc.), and inner thoughts and feelings (Guitar, 2006). Although there has been a significant amount of effort put forth in research in this area, the underlying cause of stuttering has yet to be determined. It has been suggested that stuttering has a genetic basis, but that many other environmental factors also influence its inception and course (i.e., birth of a sibling, traumatic event) (Guitar, 2006). Stuttering usually begins in childhood, and sometimes persists into adulthood. Approximately 5% of the population has encountered a period of stuttering at some point during their lives (Mansson, 2000).

There are many options available for the treatment of stuttering, including drug therapies, cognitive-behavioural therapies, psychotherapies, electronic device therapies and behavioural therapies (Guntupalli, Kalinowski & Saltuklaroglu, 2006). The latter is the most commonly used, and involves the modification of peripheral speech subsystems (e.g. slowed speech, gentle phonatory onsets, and regulated breathing, etc.) (Guntupalli, Kalinowski & Saltuklaroglu, 2006). Generalization and maintenance of the strategies that are taught in behavioural therapy to facilitate control of stuttering are two of the major problems encountered in many stuttering treatment programs (Finn, 2003). The client is often able to modify behaviours in the clinic room, but the gain is difficult to transfer to other

settings for any significant amount of time (Guntupalli, Kalinowski & Saltuklaroglu, 2006).

The treatment of stuttering usually requires intense and/or prolonged intervention with a speech-language pathologist (SLP) (Sicotte, Lehoux, Fortier-Blanc & Leblanc, 2003). In certain areas, such as Canada or Australia, geographic challenges make it difficult for persons who stutter (PWS) to access an SLP who specializes in fluency therapy as most specialized SLPs are based in large urban centres. In many realms of healthcare, telemedicine or telehealth has proven to be effective in providing treatment to patients who either live in remote areas or have a physical barrier that prohibits them from travelling to seek treatment (Theodoros, 2008). Telehealth refers to “sharing health information and providing healthcare services using interactive video, audio, computer and advanced telecommunications technologies” (ASHA Telepractices Report, 2001). There are two types of telehealth: low tech, which utilizes telephones as its primary medium of communication and high tech, which employs more complex technology such as audio-video conferencing or webcams as the delivery medium. It has been posited that the telehealth delivery model would be particularly useful in fluency therapy as it appears to have the potential to enhance the generalization and maintenance of treatment effects, which in-clinic therapy models often fail to do (O’Brian, Packman and Onslow, 2008). Webcam-based service delivery is thought to be particularly useful as it may closely replicate in-clinic experiences, because it is possible to watch the client for visual behaviours. However, it is unknown whether the identification of visual behaviours would be perfectly replicated, which may make clinical judgment difficult, leading to serious clinical

consequences. It is imperative that research be conducted in this area to find out if clinical judgments made using webcam are as reliable as those made in face-to-face therapy. Additionally, webcam programs, such as Skype, a software program for Internet communication, are widely available to anyone with a computer (Carey, O'Brian, Onslow, Packman & Menzies, 2012).

Objectives

The primary objective of this critical review is to investigate the efficacy of fluency therapy that is delivered via audio-videoconferencing for the treatment of stuttering. Outcomes measured are percent syllables stuttered (%SS), amount of treatment time, speech naturalness, situational avoidance, self-reported stuttering severity and participant satisfaction. This method of therapy delivery has been hypothesized to be useful for overcoming geographic and economic boundaries. The secondary objective of this review is to provide speech-language pathologists who may be interested in telehealth delivery with evidence-based recommendations regarding its implementation.

Methods

Search Strategy

Computerized databases including CINAHL, PubMed, SCOPUS, and Proquest were searched using the following keywords and/or MeSH terms: ((stutter) OR (stuttering) OR (disfluency) OR (fluency disorder)) AND ((webcam) OR (telehealth) OR (videoconferencing) OR (teleconferencing)). The search was limited to articles written in English.

Selection Criteria

Studies selected for inclusion in this critical analysis were required to employ a webcam-based service delivery method. No limitations were placed on the research design, participant demographics, or outcome measures.

Data Collection

Results of the literature search returned five articles that were consistent with the aforementioned criteria: expert opinion (3) and single subject design (n=3, n=6) (2).

Results

Expert Opinion

Kully (2000) reported on a 38-year-old man with severe developmental stuttering who had successfully completed a three-week treatment program at ISTAR

(The Institute for Stuttering Treatment and Research), in Alberta, Canada. Subsequently, he was enrolled in a follow up program that involved regular contact with a clinician through videoconferencing to practice specific speech skills and strategies. Feedback was gathered informally from patient and clinician, who both reported satisfaction with the effectiveness of the feedback that was given. The patient also noted that the videoconferencing format was less demanding on fluency control than a telephone format. Kully (2000) suggested that interactive videoconferencing was a feasible format for providing follow-up services to patients, and that it may supplement existing face-to-face service delivery models.

In 2002, Kully also wrote an expert opinion piece to describe ISTAR's experiences and lessons learned through the use of telehealth. At the time of the article, telehealth was not a well-researched modality of therapy delivery. As such, it lacked research-based guidelines, so ISTAR developed criteria for determining which cases were most suitable for webcam-based telehealth treatment including mild-moderate severity, good stimulability, and transportation and equipment issues. Although no formal data was reported, informal evaluations of the treatment revealed overall positive results.

The two previously discussed articles consist of information by experts in the field of fluency disorders. One of the positive outcomes of an expert opinion article is that it assists researchers in designing relevant questions that may arise from the information in the article. Expert opinion also has many limitations. Although an expert can make significant contributions to the knowledge pool of their area of expertise by sharing experiences, expert contributions should be examined with caution, as they cannot be critically appraised for research validity and are purely anecdotal. Both of the articles by Kully may be cautiously interpreted to indicate potential positive results from webcam-based fluency therapy.

Packman and Meredith (2011), who are experts on the subject of fluency therapy, presented a summary of the available literature on technology and the evolution of clinical methods for stuttering. All of the studies that have looked at the use of telehealth to treat PWS were reviewed including those studies that used a webcam-based delivery method. Information was provided about principal and unique findings of the studies and future research recommendations. Important caveats that should be taken into account when considering the use of a telehealth delivery

method were also discussed. The authors are not convinced that there is enough strong evidence to support the use of a telehealth delivery model, as they give warning to clinicians to look for evidence of the efficacy of telehealth treatment models before employing them.

Although the authors reviewed research that pertained to the particular question of the efficacy of a telehealth delivery method, they did not follow the stringent methodological criteria to evaluate the studies adequately. Therefore, the level of evidence provided by this article is low. This type of article may be useful for clinicians who want to understand the essence of the topic. The reports of strengths as well as limitations of the delivery model make it particularly useful for clinicians and others who are looking to quickly find information and make a decision about whether or not they will use web-cam based fluency therapy as treatment. Overall, however, this article does not contribute importantly to the evidence base related to webcam-based fluency therapy.

Single Subject Design

Sicotte, Lehoux, Fortier-Blanc, and Leblanc (2003) conducted a single-subject design (n-of-1) study with four children and two adolescents to investigate the feasibility and outcome evaluation of a webcam-based therapy delivery method in Quebec, Canada. All six of the participants continued in the study for its duration. Measures of percentage of syllables stuttered (%SS) were taken at baseline, at the end of the treatment period and at 6 months post treatment. Descriptive results across participants' pre and post therapy measures reflected improved fluency in that all participants demonstrated a reduction in %SS at the end of follow up (before intervention: 13-36%, at end of follow-up: 4-32%). Patient/parent and clinician questionnaires were also used as outcome measures. Qualitative data that looked at SLP ratings of technical and clinical quality found that clinicians were mostly satisfied with the sessions. Patient/parent questionnaire results indicated very positive perceptions of the treatment at both the technical and clinical level as well as great confidence in the level of care received. Overall, the therapy was deemed to have a positive outcome by all participants and clinicians.

Strengths of this study include a study design that appropriately addressed the question at hand. All six of the patients attended 100% of the therapy sessions and completed all key outcome measures. Clinicians completed 85% of the questionnaires required for feedback on technical and clinical qualities of

treatment. At least 2 samples were analyzed for %SS at each time point, although inter- and intra-rater reliability were not reported.

This study also has several limitations. The type of therapy that was used for the patients was described only as "currently accepted and well used procedures." Also, the clientele ranged in age from 3 to 19 years, and there was no indication of the likely difference in treatment programs that were used for younger clients as opposed to those in adolescence. Subjects were not described in detail, which indicates that there was no provision made for control of other confounding factors, such as baseline stuttering severity or exposure to previous treatment. Speech samples were taken only in the clinical environment, which may have caused a bias in the %SS since participants would be familiar with the environment. Overall, the evidence provided by this paper regarding webcam-based fluency therapy is suggestive of positive outcomes.

A 2012 study by Carey, O'Brian, Onslow, Packman and Menzies explored the viability of webcam-based delivery of the Camperdown program for adolescents who stutter. They had three adolescent participants, ages 13, 15 and 16 years, each of whom had moderate to severe stuttering. Primary outcome measures were %SS and number of treatment sessions to maintenance, while secondary outcome measures included speech naturalness, situational avoidance, self-reported stuttering severity, and parent and adolescent satisfaction. All treatment sessions were delivered through Skype by an SLP with 15 years of experience in the treatment of stuttering. After 18 sessions or 11 hours of treatment with the clinician, participants entered the maintenance phase. Data on %SS was collected pretreatment and at 1 day, 6 months and 12 months post entry to maintenance. All participants showed a considerable reduction from pretreatment in %SS at each time point thereafter. Self-reported stuttering severity ratings and speech naturalness ratings coincided with these results. Participants and their parents found the model appealing as web-based treatments may maximize treatment efficiency since the independence this type of program allows adolescents may increase compliance in therapy. Overall, Carey et al. suggested that the Internet is a promising medium for delivering stuttering treatment to adolescents.

Carey et al. also identified limitations in the study. First, the small number of participants may not reflect the typical adolescent population. Associated with that is the fact that the three adolescents in the trial

had stuttering rates between the 80th and 90th percentiles, which may mean that they responded differently to treatment than those with mild stuttering would respond.

Besides thorough description of participants and specification of eligibility criteria, this study included a detailed and comprehensive rationale and a well-formulated specific question that was addressed by the study design. Other strengths include the blinding of outcome assessments with inter- ($r=0.94$) and intra-rater ($r=0.99$) reliability assessed during each phase of the study. Also, when outcome assessors were determining speech naturalness, they were blinded as to the identities of the participants and their age matched controls. Carey et al. also ensured that when %SS was measured, the telephone calls to the participants were unscheduled and made by research participants who were unfamiliar and not involved in provision of treatment. When determining treatment satisfaction, interviews with the participants and their parents were conducted by an SLP not involved in the research in order to encourage transparency. Finally, nearly exact replication of this study would be possible thanks to the operationally defined intervention conditions. Overall, this study provides suggestive evidence for the effectiveness of webcam-based delivery of stuttering treatment.

Discussion and Recommendations

Webcam-based fluency therapy may be an efficient approach to providing stuttering services to people in a variety of geographic locations or to those who have a physical disability or similar drawback that prevents them from obtaining traditional fluency therapy. There are pros and cons of each type of article that was assessed. Overall, results of the evidence reviewed in the five previously mentioned articles suggest that webcam-based fluency therapy has a potential to be effective.

It must be acknowledged that there are several challenges that accompany the study of webcam-based fluency therapy. First, studies in speech and language disorders usually have a small number of participants due to the small number of patients who present with communication disorders relative to other conditions. Researchers conducting studies in this area often have to opt out of study designs that provide very high levels of evidence such as double blinding of participants and researchers or randomization of participants into groups. The limited numbers of studies reviewed indicate that

there have been positive outcomes for each individual or group that was treated through webcam based therapy. However, it is too early to say whether it is an effective alternative to traditional face-to-face service delivery models, since the evidence field is limited to small sample sizes. Additionally, it can be difficult to find age-matched controls or those who are participating in traditional face-to-face therapy with whom to compare research subjects. Many clients who are included in webcam studies are those who were unable to have face-to-face therapy to begin with, due to physical or geographic challenges.

The treatment program used in the webcam-based treatment method could also play a significant role in the effectiveness of the treatment. There is a great amount of variability in fluency treatment programs. Only one method, the Camperdown Program telehealth adaptation, was described in detail in the studies included in this review. Therefore, some fluency programs, when adapted to a telehealth delivery method, may not have the same seemingly positive outcomes.

A number of clinical issues must be explored when considering this topic. Given the fact that technology is such an integral part of the culture of developed countries at this time, it should be recognized that there might be some generational differences when it comes to the acceptance of this method of service delivery. It is likely that adolescents and children whose treatment is delivered by webcam have been exposed to technology from the time they were born. Therefore, they would have few reservations about using advanced technology in a novel way. However, some older adults may hold a completely different view, as the older adult population sometimes exhibits resistance to changes in routine and new technologies due to unfamiliarity. Therefore, this method may be more effective for certain populations.

Along with familiarity with technology, another matter that may enhance the benefit of this type of treatment is motivation. Incentive to buy-in to treatment can often be a problem for the young adult population, and this type of service delivery allows them to be more independent in treatment, as they do not need to rely on parents for transportation to and from appointments. This independence may increase compliance with treatment, which would most likely result in more positive outcomes.

Given that research is limited in the area of webcam-based fluency therapy, it is suggested that future research consider the following variables:

1. The inclusion of study participants who have the option of either face-to-face or webcam-based therapy and those whose stuttering is mild-moderate in severity.
2. Larger-scale studies (relative to those that have been conducted previously in this area) that include age-matched controls, in order to reflect the typical population.
3. The use and description of a well-defined treatment program that has been proven to be effective in face-to-face therapy.
4. The provision of control of confounding factors, such as baseline stuttering severity or exposure to previous treatment.

Conclusion and Clinical Implications

While there are some limitations to these studies, there are also some important clinical implications to be considered. As a group, the articles provide suggestive evidence that webcam-based fluency therapy is effective as treatment for stuttering. While caution is still warranted, clinicians may find that this type of service delivery becomes more and more common for those who are unable to attend face-to-face treatment. Presently, this type of therapy delivery method should be used only on a case-by-case basis after thorough consideration of client variables such as age and access to services, as well as careful implementation of an established adapted fluency intervention program. With more evidence, these findings would be particularly relevant to the intervention approaches taken by SLPs in the future when managing fluency disorders.

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