Review Article

The Effect of Digital and Conventional Speech Therapy on A Person with Speech and Comprehension Disorders: A Systematic Review

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Abstract:

Background:

The purpose of this article is to determine if digital therapy delivered speech-language pathology interventions are as effective as traditional in-person delivery for childhood to adulthood with speech and comprehension disorders.

Method:

A systematic review was conducted (following PRISMA guidelines) using five databases, two journals, and reference lists. Titles and abstracts were screened for inclusion, with relevant studies reviewed in full-text. Initial searches identified 132 articles. Following the exclusion of non-relevant studies, seven articles remained for inclusion. Results revealed both telehealth and in-person participants made significant and similar improvements when treatment effects were measured through Three of the six outcome measures.

Results:

Findings showed there is limited but promising evidence to support telehealth for delivering speech and comprehension disorders.

Conclusion:

Whilst this is encouraging, particularly for rural aphasia patients, where in-person services are limited, more rigorous study designs are required to support the efficacy of telehealth for this population.

Keywords: Tele-Neurorehabilitation, Post-Stroke Aphasia, Artificial Intelligence

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Introduction

Acquired brain injury (ABI) is a life-changing health condition that can result from trauma, cerebrovascular accidents, and brain tumors (1). The population affected by ABI is large and growing, with 69 million people worldwide suffering from traumatic brain injury (TBI) each year, (2) and the global first stroke is expected to reach 16 million in 2005. Increase to 23 million by 2030. (3). More than 75% of people after ABI experience speech and comprehension disorders such as aphasia (4).

Speech disorders can be characterized by vague speech (dissertation or speech apraxia), specific language disorders characterized by difficulty understanding or expressing language (aphasia), communication problems associated with cognitive disorders, and impaired social communication skills. (5-7). Speech disorders after ABI can affect social integration and participation in school, work and society (8). Quality of life and mood can also decrease for the affected person and his family members (9). In addition, Speech and language difficulties not only threaten academic performance during the school years, but also have a considerable impact on social and vocational inequalities in adulthood (10).

Survivors of stroke, brain injury, and people with progressive neurological diagnoses are often associated with the disorder (aphasia, dysarthria). Aphasia is a chronic condition that requires ongoing rehabilitation (11). It was once thought that recovery only occurred in the first year of a stroke; however, a growing body of evidence shows that people with aphasia (PWA) can continue to improve with ongoing rehabilitation even many years after their injury (11,12). A recent Cochrane review suggests that functional communication significantly improves when one receives speech-language therapy at a high intensity, across several sessions, or over a long period of time (13). Despite the evidence that supports the need for ongoing therapy, there are not enough therapists who can treat post-stroke aphasia. The expectation for therapists to provide therapy five times per week during the chronic phase of care is simply not feasible. In addition to limited access to therapists, other barriers that patients experience include limited insurance coverage, lack of transportation, distant geography, schedule constraints, and fatigue (14). As a result, rehabilitation for aphasia patients is quite fragmented (15), or insufficient, especially for stroke survivors living in the community but not in active therapy (11) which ultimately leads to worse patient outcomes, especially when they can benefit from ongoing therapy post-discharge. Since the COVID19 pandemic began, individuals with aphasia have faced even greater hurdles in accessing the care they need due to safety restrictions exacerbating disparities in healthcare for these individuals (16).

These challenges can prevent people with aphasia from expressing their daily needs and can result in a lack of conversations and social anxiety/exclusion (17). Problems like social isolation, lack of leisure activities, loss of social networks and mood disorders are typical for people with aphasia, and these affect their quality of life as well (18). Most speech-impaired patients are referred to a speech therapist on either a short or a long-term basis depending on their severity.

Sadly, speech therapy has seen drastic budget cuts leading to long waiting times due to staff shortages, and yet the number of patients requiring speech therapy is increasing rapidly (19). One of the recommendations from the government debate on brain injury is the need to establish collaborative research to evaluate and improve practical assessment tools, develop objective diagnostic markers and gain a deeper understanding of the recovery process and the long term risks (20).

Given the prevalence and impact of communication problems in aphasia patients in Iran, it is important that speech and language pathology (SLP) intervention be available to these adults to help develop vital communication skills. Solution to inequality of access to SLP services Some practices/ professionals have begun to use an innovative service delivery approach, commonly referred to as digital health care. This innovative solution can efficiently and cost-effectively improve the location and treatment of speech therapy for patients. The availability of such a solution reduces the workload of the speech therapist and drastically reduces the waiting time for patients.

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, post on servers or redistribute to lists, requires prior specific permission and/or a fee. Request permissions from dyspraxia and dyslexia) (21).

Telehealth-delivered SLP services have previously been investigated in reviews regarding a number of practice areas and populations. Mashima and Doarn (2008) conducted an extensive literature review on the application of telehealth in SLP with adults and a small number of studies with children. They reviewed 40 studies investigating disorders relating to adult neurogenic communication, fluency, voice, dysphagia (n=35), and childhood speech and language (n=5). This review suggested that telehealth is a feasible and effective method for providing SLP services at a distance. However, the authors noted that the reviewed literature consisted primarily of pilot studies and anecdotal accounts of telehealth applications rather than large, well-controlled, randomized clinical trials (22).

Reynolds, Vick, and Haak (2009)(23) conducted a narrative review of 29 studies which were analyzed using a quality assessment checklist. These 29 articles focused on assessment and intervention with the adult (n=19) and pediatric (n=7) population as well as an unspecified population (n=3). The authors concluded that the results achieved through the telehealth and in-person service delivery models were equivalent; however, many of the studies noted that telehealth was not a complete replacement for in-person services but may be appropriate for combined practices. These findings were consistent with the review conducted by Theodoros (2012)(24), which investigated 19 studies regarding adult neurogenic communication, voice, stuttering, dysphagia and laryngectomy follow-up and four studies regarding paediatric speech, language and literacy disorders. Edwards, Stredler Brown, and Houston (2012) (25) conducted a further review investigating 39 studies in the fields of audiology and SLP. The majority of these studies were conducted on adult populations (n=27) with neurogenic communication, voice, dysphagia and fluency disorders. The review was further expanded to include a small number of studies (n=12) focusing on early intervention services. This review by Edwards et al. (2012) suggested that telehealth is an effective way to diagnose and treat both adults and children in the areas investigated, as services provided through telehealth or by conventional in-person means resulted in similar outcomes. These studies show positive results. Digital therapies are a good alternative to face-to-face intervention for aphasia patients.

As a potential technological solution, this study examines the potential of using digital application versions such as mobile applications, virtual reality with speech recognition capabilities as a treatment tool for patients. This study was motivated by recent research on the effectiveness of using digital application prescriptions in the treatment of patients with eating disorders (15), social anxiety (16), PTSD in the military (26, 27) and helping stroke patients to regain confidence. It is caused by the soul (28). There is still a lack of research focused on exploring technological solutions such as digital application versions and virtual reality to treat patients with speech disorders. This study will examine the digital solution available for treating people with speech and comprehension disorders. However, to date no studies have been conducted specifically on the evaluation of health studies of digital therapy solutions in individuals over 18 years of age with speech and comprehension disorders. Therefore, this systematic review evaluated the present study to determine whether SLP interventions delivered through digital therapy were as effective as face-to-face delivery for individuals over 18 years of age with speech and comprehension disorders.

Method

To address this study’s aim, a systematic review was conducted in accordance with the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA)(29) The PRISMA flow chart is detailed in Figure 1 (29).

Search Strategy

A systematic literature search was undertaken using the PubMed, CINAHL, Scopus, ERIC and Speech BITE databases. Additional manual searches in two highly relevant journals, the International Journal of Speech Language Pathology and the International Journal of Telerenhabilitation, were also conducted, in order to locate more recent versions of journals that may not yet have been transferred into the databases. Systematic search strategies were performed using the following keywords: remote rehabilitation, post-stroke aphasia, virtual therapy, artificial intelligence; PC and mobile applications; Speech recognition. In addition, citations and references within identified articles were searched for further studies relevant to the review. The authors corresponded with experts in the field to ensure all relevant studies were included in the review.

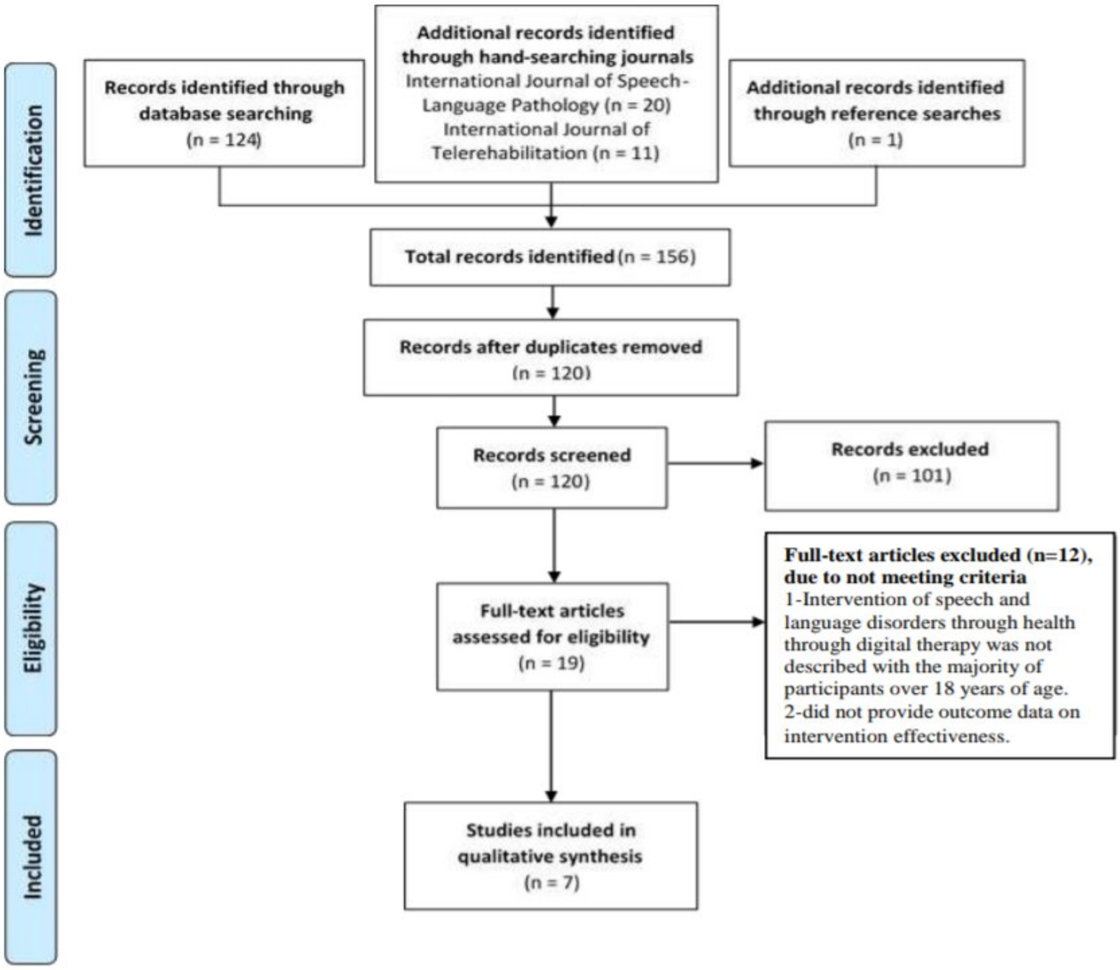

Figure 1. PRISMA flow chart showing the search and selection process that yielded the final seven articles

Study Selection

The studies identified through the systematic searches were included in the review if they reported studies of speech and language intervention delivered through telehealth from childhood to adulthood across various settings (e.g. Via email, video ads, social media ads and posts, and Community Health and Welfare Clinic), outcome data on the effectiveness of the intervention were diagnosed at least 4 months before aphasia after stroke. They were excluded if they had speech and language disorders other than a stroke, the need for treatment in another language, or if they were already using digital prescription speech therapy. The year of publication was not restricted, ensuring all available evidence was identified, but the search was limited to articles written in English. Papers were included on speech intervention (speech sound production and intelligibility) and language intervention (receptive and expressive language). Articles describing voice, fluency, pragmatics, literacy or special client populations were excluded to focus on primary speech and language disorders.

Data Extraction

All articles identified from the initial searches were reviewed and duplicates were removed. The title and abstracts of the articles were screened for inclusion by all authors, with the remaining articles reviewed in full text and the exclusion criteria applied. In the case of disparities between the authors' judgments regarding suitability, they consulted to achieve agreement. Data from the included studies were extracted using a standard table developed specifically for this review. The articles were summarised in terms of intervention type and participants, study aim and design, equipment, methods and main study results.

Results

Preliminary database and reference list searches conducted in 2020 yielded a total of 120 unique articles. During the initial screening, 68 articles were excluded on title and another 33 articles were eliminated on abstract. The remaining 19 articles were reviewed in full-text. The full-length review excluded a further 12 articles, because they: (1) Intervention of speech and language disorders through health through digital therapy was not described with the majority of participants over 18 years of age., and/or (2) did not provide outcome data on intervention effectiveness. From this selection process, seven articles were retained for the final systematic review. The review process is detailed in the flow chart in Figure 1(30,31,32,33,34,35,36).

Study Design

The seven included studies focused on telehealth-delivered speech and language intervention with childhood to adulthood. Four of the included studies were randomised controlled trials (level of evidence II) (30,33,34,35) and another study were individual studies of the evidence level method (IIIa). In fact, in-group comparisons showed significant progress in different language tasks (e.g., oral comprehension, repetition, and written language) in the VR group alone. Significant gains, after treatment, in the virtual reality group, were also observed in various psychological dimensions (ie self-esteem and emotional state and mood) (31). Two other studies used the pre-study and post-study evidence level (IV) to determine whether remote health intervention facilitated participants' improvement of communication skills without a comparison group (32,36).

Figure 2. Constant Therapy overview

Three of these articles included a participant satisfaction survey (34, 35, 36). The P SL intervention services provided in the studies included in a structured environment were performed via email, video advertising, social media ads and posts (n= 5), and the Community Health and Welfare Clinic (n=2). Studies varied according to the focus of the intervention and the outcome measures used.

Participants

The participants in the studies were aged from childhood to adulthood the results were suitably applied population of aphasia after stroke. other studies however were excluded during the initial study selection process due to the majority of participants being excluded if they had speech and language disorders other than a stroke, the need for treatment in another lang or if they were already using digital prescription speech therapy. All of seven studies were aged childhood to adulthood (30,31,32,33,34,35,36).

Intervention Type, Intensity And Targets

All of the included studies investigated the application of both speech sound and language intervention through telehealth (30,31,32, 33, 34,35,36).

One of the aims of this study was to investigate the patterns of digital therapy use. The Constant Therapy platform curates a program that continuously identifies and addresses an individual's recovery needs, enabling patients to practice and advance independently (Figure 2) (37,38).

Telehealth Equipment

Two papers reported the use of commercial videoconferencing systems (30,36) designed for use with low-speed connections (using a 128 kbit/s internet. In contrast, three studies reported the use of web-based videoconferencing platforms (31,32,35) and the final study used a custom telehealth videoconferencing system (33). studies complemented their telehealth equipment with document cameras (34). The seven reviewed studies used real-time videoconferencing.

Combined Speech And Language Intervention

language interventions were conducted in 7of the seven studies. The duration of the intervention varied between studies. Study participants received treatment for 10 weeks by Braley et al. (2021) using digital therapy, and continuous therapy (CT-R) for speech, language, and cognitive therapy (30). In the study, Giachero et al. (2020) received treatment for 6 months using telephone call therapy for speech, language, and cognitive therapy (36). In the study of Munsell et al. (2020) the following three activity criteria were evaluated: (1) number of active weeks of treatment, (2) average number of days of active treatment per week, and (3) total number of treatment sessions completed during the first 20 weeks Access the app. An active day or week was defined as having at least one complete treatment session. Separate multiple linear regression models were performed with each activity measurement as a dependent variable and all patient demographic information as auxiliary variables of the model. Its findings showed a frequency of 1.5 days of treatment for 8.6 weeks (33). In the study by Palme et al. (2019), they received treatment for 6 months of routine care (routine care group), CSLT daily self-management combined with routine group care (CSLT) (34). In the study, Calati et al. (2020) received training twice a week for six months (48 sessions in total) (32). Kim et al. (2021) Participants in the intervention group will participate in 5 weeks of training with this application, followed by post-treatment and follow-up evaluations after another 5 weeks. Those in the waiting list

control group will not have any training for 5 weeks. After that, pre-treatment evaluation, training for 5 weeks and post-treatment evaluation were performed (35). In the Northcott study, they received six sessions of treatment for 3 months (33).
Further differences between the studies focussing on both speech and language intervention related to whether or not the treatment sessions were provided on an individual basis or in a group setting. An individual format was adopted in two of the studies (34,36). however, in the two studies, the participants in the telehealth groups received mainly individual therapy sessions with some small group sessions also conducted (36). The intervention provided varied depending on the selected targets. A study selected intervention targets based on the participant's IEP goals and objectives (35). whereas another a studies established therapy goals based on recent assessment results (33). Two other studies developed objectives (34,36). Three studies performed the analysis (33,34,36).

Outcome Measures

The included studies examined the efficacy of telehealth intervention using various outcome measures. three different outcome measures were investigated: Functional Communication Measures (FCMs); goal achievement; comparison of preintervention baselines with post-intervention production levels.

Efficacy of Therapy

Communication Functional Measures (FCMs)

Three studies measured outcomes through Functional Communication Measures (FCMs), Which was used as a measure of progress in the database of the system of measuring the consequences of mobile applications (33,34, 35).
The results of these three studies demonstrate conflicting findings; however, one of these studies performed statistical analysis of the results and thus the significance of the percentage differences between the three intervention conditions is unknown. The limitations evident in both three studies could also likely have introduced confounding factors, which may have affected the results. For instance, two study had a considerable difference in the sample size for the three conditions and did randomly allocate participants, but instead selected the digital therapy participants from two pilot project already being conducted (35,34). The selected participants were allocated to the telehealth condition and their results were compared with data already stored in the Mobile Application Impact Assessment System database, therefore introducing potential bias. One of these studies controlled for the type of service utilised (e.g., individual or group therapy) or the methods of treatment provided (33).

Goal Achievement

studies (30) used goal achievement to determine outcomes, with one study using Goal Attainment Scaling (GAS), a criterion eferenced measure of change rated on a five-point scale, to evaluate the telehealth program (33,36). This study (33) the number of active weeks of therapy, the average number of active therapy days per week, and the total number of therapeutic sessions completed during the first 20 weeks of program access. An active day or week was defined as having at least one completed therapeutic session. Used to evaluate the results. Digital therapy was demonstrated in this study. That data for 2850 patients with stroke or TBI were analyzed, with the average patient completing 8.6 weeks of therapy at a frequency of 1.5 days per week. Contrary to known barriers to technological adoption, older patients were more active during their first 20 weeks of program access, with those aged 51 to 70 years completing 5.01 more sessions than patients aged 50 years or younger (P=.04). Similarly, patients living in a rural area, who face greater barriers to clinic access, were more digitally engaged than their urban counterparts, with rural patients completing 11.54 more (P=.001) sessions during their first 20 weeks of access, after controlling for other model covariates. But in the study (34), group interventions: (1) were routine care. (2) Daily computer orthodontic treatment designed by speech and language specialists and supported by volunteers/ assistants of speech and language therapy for 6 months in addition to routine care (computer speech therapy and language therapy). (3) Activity / attention control (completing puzzles and receiving phone calls from a researcher for 6 months) plus routine care. Main Outcome Measures Primary Common Outcomes - Change in the ability to find personally related related words in the Custom Naming Test (Disorder) and change in functional communication in the conversation ranked according to the Activity Scale Therapeutic Outcome Measures (Activity) 6 months later from randomization. A key secondary outcome was the participant's perception of communication and quality of life using the 6-month post-stroke communication outcome questionnaire. The results were evaluated by speech therapists and language therapists using standard methods. The results showed that a total of 240 participants (86 routine care, 83 speech and computer language therapy, 71 attention control) intended to participate in the correction. Treatment analysis at 6 months had a mean progression of terminology of 1.1% (standard deviation 11.2%) for routine care, 16.4% (standard deviation 15.3%) for speech and computer language therapy, and 2.4% (standard deviation 8.8%) for attention control. Speech and computer language therapy improved word retrieval 16. 2% more than standard care (95% confidence interval 12.7% to 19.6%; p <0.0001) and 14.4% more than attention control (95% confidence interval 10.8% to 18.1%). Most of this effect was maintained at 12 months (n = 219). The mean difference in change in word search score was 12.7% (95% confidence interval 8.7% to 16.7%). More words increased in the speech and computer language therapy group (74 people) than in the usual care group (n =84) and 9.3% (95% confidence interval to 13.7%) increased in the computer speech and language therapy group compared to the attention control group (61 patients). Computed speech and language therapy did not show significant improvement in outcome measures or communication consequences after stroke compared to routine care or attention control.

Baselines with Post-Intervention Production Levels

Two studies (36, 34) were evaluated in terms of speech and computer therapy self-administered computer (CSLT). The difference between the two is that in Study (5) the measurement of initial common outcomes - a change in the ability to find personally related words in a custom naming test (disorder) and a change in functional communication in a conversation based on rank. Activity Scale Therapeutic outcome measures (activity) is 6 months after randomization. A key secondary outcome was the participant's perception of communication and quality of life using the 6-month post-stroke communication outcome questionnaire. However, study participants (34) were diagnosed with post-stroke aphasia at least 4 months before randomization. Randomly in sizes three and six, classified by location and word intensity are initially based on object test scores.

Participant Satisfaction

Three studies reported satisfaction data through the provision of surveys (36,35,34). High levels of satisfaction from the remote-provided intervention and the progress achieved were found in all studies (30,31,32,33,34,35,36).

Discussion

The present review investigated the efficacy of telehealth-delivered SLP services when aphasia patients after 4 months of stroke with speech disorders and / or office perception difficulties. Evidence was collated through a systematic review of the digital therapy available literature. overall, the findings of the review showed that there is some evidence to support the use of telehealth when delivering SLP intervention services. However, it also aphasia patients after 6 months of stroke with speech disorders and/or office perception stated that the amount of research into speech and language intervention for via the telehealth service delivery model is limited and of variable quality, as the included studies span across the levels of evidence according to the National Health and Medical Research Council (NHMRC).

A total of three different types of outcome measures were used to investigate the efficacy of telehealth intervention, two studies were designed using goal achievement criteria (36, 33). However, these measures demonstrated considerable progress based on the targeted goals during the telehealth intervention.

Positive results were also identified in studies that used a comparison of baseline before intervention and post-intervention production levels to measure outcomes, with both studies showing that progress was achieved regardless of treatment (36, 34). Both voice and speech language interventions were performed as part of the seven studies in this study. However, among these reviewed studies, there seems to be a stronger focus on speech voice intervention, with all studies primarily aimed at assessing this range of practice through remote health done.

The results of these three studies demonstrate conflicting findings; however, one of these studies performed statistical analysis of the results and thus the significance of the percentage differences between the three intervention conditions is unknown. The limitations evident in both three studies could also likely have introduced confounding factors, which may have affected the results. For instance, two study had a considerable difference in the sample size for the three conditions and did randomly allocate participants, but instead selected the digital therapy participants from two pilot project already being conducted (35,34). The selected participants were allocated to the telehealth condition and their results were compared with data already stored in the Mobile Application Impact Assessment System database, therefore introducing potential bias. One of these studies controlled for the type of service utilised (e.g., individual or group therapy) or the methods of treatment provided (33). Making it difficult to determine if the difference between the results is significant.

However, of the reviewed studies, there appeared to be a stronger focus on speech sound intervention, with three studies primarily aiming to assess this range of practice area through digital therapy. The remaining four studies investigated the application of both speech sound and language intervention through digital therapy., however three focused more heavily on speech than on language, as a greater number of speech goals were targeted in one study (33)and more speech-based FCMs were used as an outcome measure in another study (34و35). Overall, whilst the studies revealed that intervention delivered through digital therapy is as effective as in-person intervention, this result seemed to be found more consistently with the provision of speech sound intervention than with language intervention. Although this suggests that speech sound intervention may be more suited to a digital therapy approach, this finding is likely to be skewed by the more predominant focus on this range of practice area in the reviewed studies. Another possible explanation for this result is the difficulty in identifying comprehensive measures of language to be used when conducting research relating to digital therapy delivered services, as language is such a broad and highly variable range of practice area.

nterestingly, all of the reviewed studies utilised realtime videoconferencing facilities, allowing the clinician and client to visualise each other. This finding is consistent with results from previous reviews (28,37,38,39,40,41,42,43, 44), indicating that real-time interactions support the delivery of services and strongly influence the clinical outcomes achieved through telehealth. Delivering speech and language intervention services through real-time videoconferencing facilities is an effective method of service delivery as this medium most closely resembles in-person interactions through the transmission of auditory and visual signals at a distance. SLP practice primarily consists of auditory, verbal and visual interactions, therefore allowing services to be easily translated into technology-based environments. This level of connection enhances the sense of clinician presence and facilitates the development of rapport between clinicians, clients and their families, provided that the necessary bandwidth is available to support the process.

Overall, the findings from the seven reviewed studies revealed that digital therapy is a promising method for people with speech and/or language difficulties. However, in spite of this interesting finding, a number of methodological issues limit the quality of the results. The conclusions found in the literature on the effectiveness of telehealth-delivered intervention are dependent on the selected outcome measure. Outcomes for digital therapy were more consistently positive when standardised assessments were used for the pre- and post- intervention testing. Studies have also shown significant changes in treatment intensity, In the study (35), 5 weeks of in-app training, followed by post-treatment evaluations and follow-up for another 5 weeks, showed significant improvement. In the study (32), six sessions over 3 months, immediately after the accident or after 6 months of delay, provided treatment. In study (33), one day or week was active as having at least one treatment session. In study (31), they were treated twice a week for six months (48 sessions in total), making the intervention format more intense. Additionally, the majority of the studies reviewed were based on a small and unequal sample size, resulting in difficulty generalising the results. Furthermore, of the four studies comparing the service delivery models, two studies did not randomly allocate participants to the intervention conditions, therefore introducing potential intervention condition bias. These differences in the studies made direct comparison difficult and therefore, may limit the weight of the findings. Thus, to provide further evidence regarding the effectiveness of telehealth-delivered intervention, studies that use more rigorous methods, such as randomisation of participants and power calculations, need to be performed to ensure that potential key findings can be accurately identified.

The current systematic review, allows the results of the study to be properly applied to the adult population of people of with aphasia, without deviating the data from a combination of different populations.

Amultidisciplinary approach should be taken from the earliest stages of the design and development of a language speech therapy program and should include SLPs, human-computer interaction researchers, user experience researchers, developers, and people with communication disorders. This approach ensures attention to human-centered design (64) and evidence-based treatment techniques with respect to the level of interaction, function, aesthetics, and information. More research needs to be done to find out how people with communication disorders engage or shy away from mobile-based treatment plans over time in relation to their health goals. There are still unanswered questions about the long-term success of SLP programs that are accessible to people with communication disorders. This study is proposing the use of a fully immersive VR application along with an appropriate automated speech recognition model for treating people with aphasia. The development process will follow a user-centred design involving the speech therapists and people with aphasia. The VR scenarios will also be a scripted-based treatment design, consisting of oral conversation via short dialogues in a realistic situation in the virtual world. The realistic VR environment will create a sense of presence for the users. It is hoped that this will aid their progression in integrating into real life.

Another essential component of this application is the speech recognition model. The reviews in outlined some of the challenges of the current ASR models for people with aphasia. However, the recent emergence of Artificial Intelligence (AI) and machine learning for speech recognition is narrowing this gap. The use of AI will present a dataset challenge, as there is currently no compressive repository of datasets (speech of people with aphasia) to train a machine learning model.

Some of the available AI-powered speech recognition systems such as the IBM Watson Speech-to-Text, Amazon Transcribe Service (AWS), Google Speech-to-Text and Nuance Dragon Transcription have shown relatively good performance for fluent speakers. However, its accuracy for people with aphasia is still unknown. Hence, it is imperative to assess the effectiveness of the available speech recognition models for people with aphasia.

Conclusions

The purpose of this article is to determine if digital therapy delivered speech language pathology interventions are as effective as traditional in person delivery for people with speech and comprehension disorders. The reviewed research was limited and of variable quality, however, the evidence presented showed that digital therapy is a promising service delivery method for delivering speech and language intervention services to this population. This alternative service delivery model has the potential to improve access to SLP services for as traditional in-person delivery for people living in geographically remote areas, reducing travel time and alleviating the detrimental effects of communication difficulties on education, social participation and employment. Although some initial positive findings have been published, there is a need for further research using more rigorous study designs to further investigate the efficacy of elehealth-delivered speech and language intervention.

The authors predict that this program will reduce the workload of the speech therapist and increase the long-term recovery process for people with speech and language disorders. The project will adopt a user-centered design approach consisting of a speech therapist and people with speech and language disorders. This program provides an opportunity for a speech therapist to create a customized treatment plan that meets the patient's needs. The initial interest among speech therapists for this solution has been encouraging, and development work will begin soon.

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