Effects of videoconferencing

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REVIEW

Effects of videoconferencing intervention on stroke survivors: A systematic review and meta-analysis of randomised controlled studies

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Abstract

Background: Videoconferencing has been proposed as an innovative telerehabilitation approach for stroke survivors, demand for which is growing.

Aim: To evaluate the efficacy of a videoconferencing intervention for stroke survivors.

Design: Systematic review and meta-analysis.

Methods: We conducted a systematic review of the literature in the databases Academic Search Complete, CINAHL, Cochrane Library, EMBASE, MEDLINE, PubMed, Ovid (and its companion UpToDate), and Web of Science published from January 1, 2002, to May 27, 2021. The methodologic quality of the included studies was evaluated using version 2 of the Cochrane risk-of-bias tool. A meta-analysis using a random-effects model calculated the pooled standardised mean difference (SMD) for using a videoconferencing intervention with stroke survivors and for the ability of survivors to perform activities of daily living (ADLs) and to maintain balance. The Stata software application (version 16.0: StataCorp LP) was used for the statistical analysis.

Results: Nine studies with 603 participants were included in the analysis. Videoconferencing interventions were observed to be effective in improving the ability of stroke survivors to carry out their ADLs (SMD: 0.57; 95% confidence interval [CI]: 0.13 to 1.01) and to recover their balance (SMD: 1.96; 95% CI: 1.27 to 2.66).

Conclusions: Stroke survivors were able effectively to improve their ADL and balancing abilities. Further studies could consider the frequency, duration, and standard protocol for videoconferencing interventions.

Relevance to Clinical Practice: This study could change the approach to patient support in future clinical practice and might constitute an alternative for improving care for stroke survivors in their homes or in long-term care facilities.

International Prospective Register of Systematic Review (PROSPERO): Registration number CRD42021257528.

KEYWORDS
activities of daily living, balance, meta-analysis, stroke survivors, telerehabilitation, videoconferencing

1 | INTRODUCTION

Stroke remains a major cause of death and disability worldwide and is becoming a major issue in public health policy in the 21st century (Donkor, 2018; Katan & Luft, 2018). The burden of stroke disability could continue to increase because of the prediction that 1 in 4 people worldwide may experience stroke (GBD 2016 Disease and Injury Incidence and Prevalence Collaborators, 2017). More than 80 million stroke survivors are disabled; that number could rise in coming decades, adding up to 50% more new stroke survivors every year (Duncan et al., 2021; Mendis et al., 2015). Patients who have experienced stroke commonly acquire significant motor deficits that lead to difficulties performing activities of daily living (ADLs) and that require continuous rehabilitation to increase functional recovery after a stroke (Brewer et al., 2013).

People affected by stroke should initiate neurorehabilitation within the subsequent 3 months even if they are already discharged from the hospital, because preventing chronic damage to brain plasticity is crucial (Ostrowska et al., 2021; Podury et al., 2021). During the COVID-19 pandemic, several countries reported that admissions to hospital for stroke declined (Jansen et al., 2021). Furthermore, the length of the hospital stay was shortened, and access to a rehabilitation unit was significantly limited. Stroke survivors discharged directly back to their community therefore had limited access to specialised stroke rehabilitation (Smith et al., 2020). Telerehabilitation thus became one of the alternative pandemic solutions for addressing barriers to rehabilitation, allowing patients to use communication technologies to continue their rehabilitation at home (Markus & Brainin, 2020; Podury et al., 2021; Smith et al., 2020).

Recently, interest in and demand for telerehabilitation have been increasing as interconnection technologies have gained in prevalence, sophistication, and convenience, and declined in cost. Using these technologies, healthcare providers can provide monitoring, education, treatment, and support in a patient's' residential environment (Appireddy et al., 2020; Galea, 2019; Laver et al., 2020). Videoconferencing is a new technology in telerehabilitation that provides two-way audio-visual communication for people in multiple locations. Using videoconferencing on a desktop computer or mobile device, healthcare professionals can support a stroke patient's' physical exercise and health communication needs (Chiauzzi et al., 2020; Hwang et al., 2017). Moreover, some studies report that, compared with other types of telerehabilitation, videoconferencing, which supports real-time audio-visual engagement, provides benefits that are both physical (improved balance, performance of ADLs, memory, and sleep) and psychological (improved self-confidence, motivation, and quality of life) (Beit Yosef et al., 2019; Chen et al., 2017; Lloréns et al., 2015).

What does this paper contribute to the wider global community?

- Videoconferencing is proposed as an innovative telerehabilitation approach for stroke survivors.
- This modelling study demonstrates that a videoconferencing intervention proactively improves the quality of care for stroke survivors.
- Videoconferencing has been adopted to optimise healthcare service delivery for stroke survivors. Our meta-analysis demonstrates its clinical benefits for improving ADLs and maintaining balance in stroke survivors.
- To aid future research, development of a standard protocol for videoconferencing might be necessary.

A previous meta-analysis of 13 studies published from 2000 to 2018 that included 605 stroke survivors indicated that telerehabilitation, compared with traditional treatments to improve ADLs, did not significantly improve or similarly affect ADLs ($p = .67$) (Rintala et al., 2019). During the same period, a Canadian systematic review that included 2058 participants from four countries (United States, United Kingdom, Germany, and China) specifically compared the effectiveness of videoconferencing with that of telephone-only interactions in delivering healthcare for other medical issues. The study determined that videoconferencing, compared with telephone-only interactions, appeared to offer more advantages in mortality ($p = .043$), smoking cessation ($p = .03$), seeking medical attention ($p < .001$), and readmission ($p = .003$) (Rush et al., 2018).

Previous systematic reviews that explored the effects of telerehabilitation on stroke survivors considered various modalities such as telephone, email, and videoconferencing. To our knowledge, no systematic review and meta-analysis has focused on videoconferencing alone to confirm its success in stroke survivor recovery. Additionally, because the number of stroke survivors worldwide is projected to increase, effective and efficient rehabilitation also is projected to be in increasingly high demand. In the COVID-19 pandemic, healthcare providers can safely deliver rehabilitation for vulnerable groups such as stroke survivors through videoconferencing telerehabilitation. Analysing recent randomised controlled trials (RCTs) of videoconferencing telerehabilitation for stroke survivors is therefore more urgent than ever. In this systematic review and meta-analysis, we therefore aimed to determine the effectiveness of videoconferencing for improving ADLs and maintaining balance in stroke survivors.

2 | MATERIALS AND METHODS

The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statement (Page et al., 2021) guided our work in this study (Data S1), which is registered in the PROSPERO international prospective register of systematic reviews: CRD42021257528.

2.1 | Search strategy

The databases Academic Search Complete, CINAHL, Cochrane Library, EMBASE, MEDLINE, PubMed, Ovid, and the Web of Science were systematically searched for relevant literature from inception to May 27, 2021. These medical subject headings were used to develop the search: "stroke survivors" OR "post-stroke" OR "after stroke" OR "stroke patients" AND "videoconferencing" OR "tele-stroke" OR "tele-stroke" OR "tele-rehabilitation" OR "tele-rehabilitation" OR "telemedicine" AND "randomized controlled trial" OR "RCT" OR "randomized controlled studies" OR "RCTs". The search strategy is summarised in Data S1.

2.2 | Eligibility criteria

We used the PICOS (Population, Intervention/issue of interest, Comparison, Outcome, and Study design) method to determine which of the retrieved studies to include (Amir-Behghadami & Janati, 2020). Studies were included if (a) the participants were patients post stroke, (b) videoconferencing was the intervention, (c) the study design was an RCT, and (d) the publication was in English. Studies were excluded if (a) the participants were not stroke survivors, (b) the intervention was not videoconferencing, (c) the publication was not in English, or (d) the article described a protocol or an observational study.

2.3 | Study selection and data extraction

Two reviewers used the defined eligibility criteria to independently screen titles and abstracts after duplicates had been removed. The PRISMA flow diagram was then used to determine a study's eligibility, with each reviewer independently performing the selection process for all studies. The full texts of all studies that passed the first level of screening were then retrieved. After a full-text review by the two reviewers, data were extracted from the eligible studies.

The data extracted included authors, publication year, country, study design, intervention setting, participant demographics (e.g., total participants, number of women, age), intervention details (e.g., intervention type in the test and control groups, intervention provider, frequency and period of intervention, and follow-up), and outcomes.

2.4 | Risk-of-bias assessment

Two reviewers independently evaluated each study using version 2 of the Cochrane risk-of-bias tool for randomised trials (RoB 2) (Sterne et al., 2019). The RoB 2 tool assesses the risk of bias in seven domains: (a) the randomization process, (b) the participant recruitment period, (c) deviations from the intended intervention, (d) missing outcomes data, (e) measurement of outcomes, (f) selection of the reported results, and (g) overall risk of bias. A study was considered to have a high overall risk of bias if three of the seven domains were at high risk of bias. Finally, funnel plots showing effect size relative to standard error were created as a visual aid for assessing systematic heterogeneity or bias in the included studies. Any disagreement was resolved by consensus, with a third reviewer being consulted as required.

2.5 | Statistical analysis

2.5.1 | Data synthesis

The standardised mean difference (SMD), with a 95% confidence interval (CI), was calculated when the included studies used different scales to measure the same outcome. (Liu et al., 2017; Sedgwick & Marston, 2013). In that process, the raw mean difference and standard deviation were first determined, and then the effect size (the Cohen' d) was calculated for both the intervention and the control group.

2.5.2 | Data analysis

Using a random-effects model, the pooled SMDs for performing ADLs and maintaining balance were calculated for each group of stroke survivors. The heterogeneity of each variable in the pooled estimate was indicated by τ^2Q and I^2. For I^2, a score of 25%–49% indicated low heterogeneity, 50%–74% indicated moderate heterogeneity, and >75% indicated high heterogeneity (Higgins et al., 2019; Lipsey & Wilson, 2001). Forest plots were generated for all analyses. The Egger' test was applied to measure publication bias related to small sample size. A value of $p<.05$ was considered significant. All statistical analyses were conducted using the Stata software application (version 16.0: StataCorp LP).

3 | RESULTS

3.1 | Study selection

The search of the eight databases identified 426 publications, of which 182 were removed because they were duplicates. The titles and abstracts of the remaining 244 publications were screened against the pre-established eligibility criteria. As a result, 196 publications were deemed ineligible for not meeting the PICOS criteria: (a) in 86 publications, the study participants were not stroke survivors; (b) in 59, the intervention was not videoconferencing; (c) in 48, the study design was not an RCT; and (d) in 3, the publication was not in English. The remaining 48 publications were advanced to full-text screening.

During the full-text screening, 39 studies were excluded: 11 because they did not implement videoconferencing as the intervention, and 28 because they were not RCTs. The remaining 9 studies were included in our review. Figure 1 shows the selection process in a PRISMA flow diagram (Moher et al., 2009).

3.2 | Study characteristics

Of the nine included studies, four were conducted in China, and one was conducted in each of the United States, New Zealand, Korea, Spain, and Canada. The analysis included 603 stroke survivors. More than half the participants were men (53%), but one study did not report the gender of the participants. The ages of the participants ranged from 55 to 73.5 years.

The intervention providers included occupational and physical therapists, trained research assistants, neurologists, and nurses. Interventions covered a range of educational topics, including physical exercise and home care of stroke survivors. The total intervention time ranged from 6 weeks to 3 months. The follow-up period after the interventions ranged from 6 months to 24 months. Tables 1 and 2 summarise the study details and the characteristics of the interventions.

3.3 | Risk of bias

All included studies were found to have an overall low risk of bias (Data S1). The analysis using the RoB 2 tool indicated a potentially

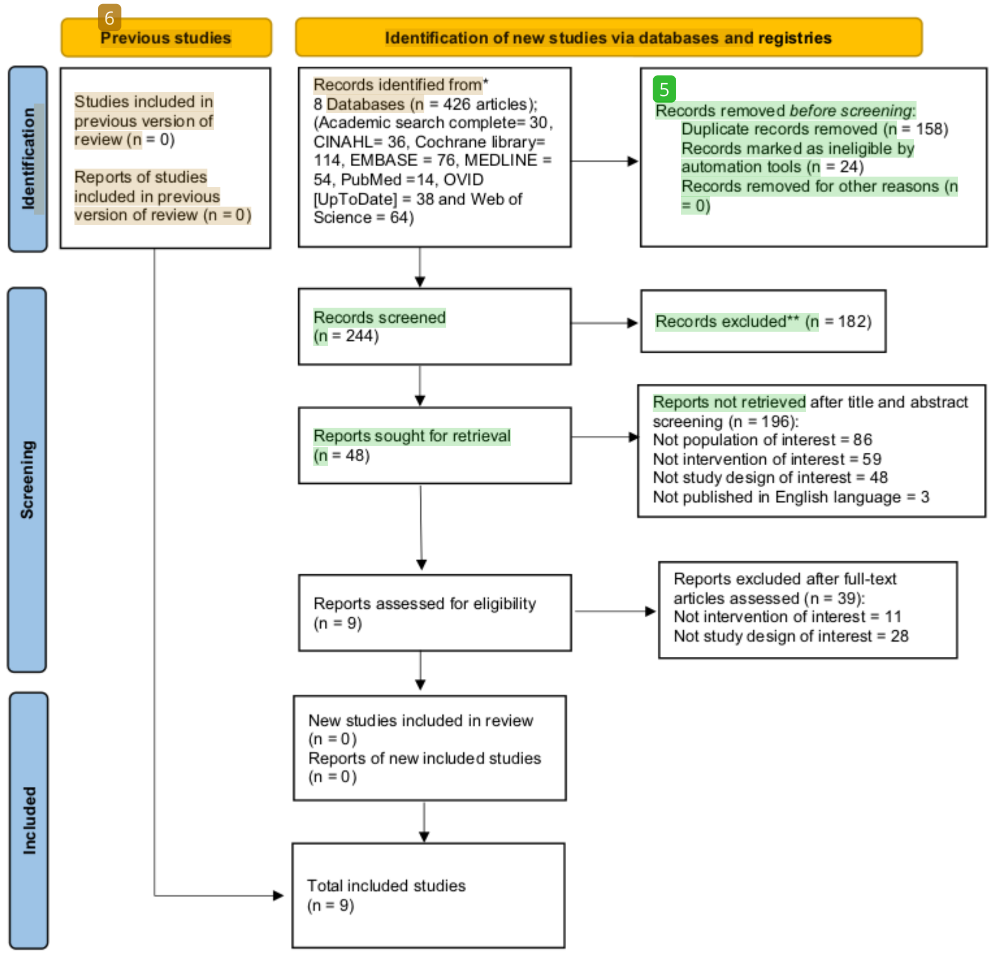

FIGURE 1 PRISMA flow diagram showing the process of study selection. *Consider, if feasible to do so, reporting the number of records identified from each database or registry searched (rather than the total number across all databases/registries). **If automation tools were used, indicate how many records were excluded by a human and how many were excluded by automation tools. From: Page et al. (2021). For more information, visit: http://www.prisma-statement.org/.

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TABLE 1 Study details and participant data.

Study details			Participant data			
Reference	Country	Setting	Sample (*n*)	Women (*n*)	Mean age (years)	Other
Chen et al. (2021)	China	Home and outpatient rehabilitation department	52	26	61.8	Hemiplegic, NIHSS score of 2–20
Chumbler et al. (2015)	USA	Post-stroke >6 months, MMSE score > 23	52	NA	NA	Stroke within previous 24 months
Huijbregts et al. (2009)	Canada	Community	18	10	63.7	Patients with stroke who had completed active rehabilitation and were living in the community
Chen et al., (2017)	China	Home (right after discharge from hospital)	54	21	66.33	Hemiplegic; NIHSS score of 2–20. mRS score of 1–5; no previous rehabilitation intervention
Li et al. (2020)	China	Home	120	71	59.55	Normal cognitive function, with MoCA cutoff score of >26
Lloréns et al. (2015)	Spain	Neurorehabilitation unit and home	30	13	55.53	Post stroke >6 months; MMSE score of >23; BBA section 3, levels 7–12
Oh et al. (2019)	Korea	Medical center	31	10	55	First stroke, unilateral paralysis or paresis, with a FMA-UE score of >18
Saywell et al., 2021	New Zealand	Home	95	46	73.5	First hemispheric stroke
Wu et al. (2020)	China	Hospital and home	61	25	57.67	Ischemic or hemorrhagic stroke; neurologic deficit degree score (NIHSS score of 5–15); limb dysfunction (Brunnstrom function stages II–III); caregiver capacity scale score of 40

Abbreviations: BBA, Brunel Balance Assessment; FMA-UE, Fugl–Meyer Assessment, upper extremity; MMSE, Mini-Mental State Examination; MoCA, Montreal Cognitive Assessment; mRS, modified Rankin Scale; NIHSS, U.S. National Institutes of Health Stroke Scale.

high risk of bias in the randomization process because of (a) lack of concealment of treatment and lack of blinding to treatment for participants, (b) a therapist who administered the intervention, and (c) an assessor.

3.4 | Effects of videoconferencing

3.4.1 | Ability to perform ADLs

Four studies involving 318 participants used the Modified Barthel Index to report the effects of videoconferencing on ability to perform ADLs (Chen et al., 2017; Li et al., 2020; Saywell et al., 2021; Wu et al., 2020). The pooled SMD was estimated at 0.57 (95% CI: 0.13 to 1.01; $I^2 = 71.99\%$; $p = .01$; Figure 2a), which indicated that, compared with the control group, the group receiving the videoconferencing intervention had a greater ability to perform ADLs. The associated Egger' test was nonsignificant ($t = 2.19$, $p = .160$).

3.4.2 | Ability to maintain balance

Four studies involving 160 participants used the Berg Balance Scale to report the effects of videoconferencing on ability to maintain balance (Chen et al., 2017; Huijbregts et al., 2009; Lloréns et al., 2015; Wu et al., 2020). The pooled SMD was estimated at 1.96 (95% CI: 1.27 to 2.66; $I^2 = 66.49\%$; $p < .001$; Figure 2b), which indicated that, compared with the control group, the group receiving the videoconferencing intervention were better able to maintain balance. The associated Egger' test was nonsignificant ($t = 1.59$, $p = .253$).

4 | DISCUSSION

In the present meta-analysis, we examined the effectiveness of videoconferencing for the telerehabilitation of stroke survivors. Of nine studies, eight had a similar target focus on ADLs and balance. The other study identified the effect of a videoconferencing intervention on cognitive, fall, and satisfaction outcomes.

TABLE 2 Characteristics of the interventions.

Reference	Intervention					Outcome
	Provider	Control group	Intervention group	Frequency/period	Follow-up	
Chen et al. (2021)	Therapist: OT or PT	Conventional rehabilitation, face-to-face with the rehabilitation therapists	Home-based TR using a TRS under therapist guidance	12 Weeks; 10 sessions per week of 60 min training with OT and PT, and 20 min of ETNS	Baseline; immediate; after 12 weeks	ADLs (MBI)
Chumbler et al. (2015)	Researchers	Usual care: home health care	STeleR with an exit interview of patient satisfaction	3 Home visits, 5 telephone calls, and an in-home messaging device provided 3 months	Baseline; 3 months; 6 months	Fall (FES); satisfaction with care (SSPSC)
Huijbregts et al. (2009)	2 Facilitators: 1 in person and 1 connected by videoconference	Waiting list control group; telehealth delivery of MOST intervention after intervention group	Telehealth delivery of MOST intervention using videoconferencing after 6 weeks of assessment	9 Weeks; 18 sessions consisting of 1 h of discussion, followed by 1 h of exercise	Baseline; immediate; after 9 weeks	Balance (BBS); depression (GDS)
Chen et al., (2017)	Trained therapist	Rehabilitation such as physical exercises and ETNS in the outpatient rehabilitation department	Rehabilitation by telerehabilitation system: physical exercises and ETNS supervised by therapist through live videoconferencing	12 Weeks; 120 sessions of physical exercises for 1 h; and ETNS for 20 min (conducted twice each weekday)	Baseline; 12 weeks; 24 weeks	ADLs (MBI); balance (BBS); global disability (mRS); muscle contraction condition (mRS)
Li et al. (2020)	Research assistants with training in physical therapy, occupational therapy, or rehabilitation medicine.	Telephone follow-up using WeChat app[a]	Videoconferencing follow-up using WeChat app[a]	Two mHealth[b] app follow-up sessions (either videoconference or telephone); first follow-up session at 2 weeks, then home visit assessment; second follow-up session at 3 months, then continuing with home visits	Baseline; 2 weeks; 3 months	ADLs (MBI)
Lloréns et al. (2015)	PT	Usual care: system in the clinic	Rehabilitation by telerehabilitation system at home	Twenty 45-min training sessions (3 times weekly on Mon., Wed., Fri.), administered in the clinic or at home, consisting of six 6-min repetitions with 90-s breaks using the telerehabilitation system	Baseline; 8 weeks; 12 weeks	Balance (BBS)
Oh et al., 2019	OT	Conventional occupational therapy	Training using virtual reality combined with real instrument training.	Training for 30 min daily, 3 days weekly for 6 weeks	Baseline. 6 weeks, at week 10	Cognitive function (MMSE)
Saywell et al. (2021)	PTs who had completed ACTIV training.	Usual care: no further formal rehabilitation	ACTIV through face-to-face sessions, telephone contact, and text messages.	Four face-to face visits, 5 structured telephone calls, and personalised text messages	Baseline; 6 months; 12 months	Stroke impact scale (SIS); self-efficacy questionnaire (SSEQ)
Wu et al. (2020)	Collaborative care model consisting of neurologists, nurses, rehabilitation therapists, counsellors, and caregivers. Rehabilitation engineer and rehabilitationnurse	Routine rehabilitation; nursing measures including dietary guidance, medication guidance, and rehabilitation guidance, all conducted by telephone follow-up once weekly	Home remote rehabilitation based on a collaborative care model; Internet-based TCMeeting ver. 6.0[b] videoconferencing twice weekly	Personalised remote rehabilitationtwice weekly	Baseline(day ofdischarge);4th week;8th week;12th week	Balance (BBS);ADLs (MBI)

Abbreviations: ACTIV, Augmented Community Telerehabilitation Intervention; ADLs, activities of daily living; BBA, Brunel Balance Assessment; BBS, Berg Balance Scale; ETNS, electromyography-triggered neuromuscular stimulation; FES, Fall Efficacy Scale; GDS, Geriatric Depression Scale; MBI, Modified Barthel Index; MMSE, Mini-Mental State Examination; MOST, Moving On after Stroke; mRS, Modified Rankin Scale; OT, occupational therapist; PT, physical therapist; SIS, Stroke Impact Scale; SSEQ, Stroke Self-Efficacy Questionnaire; SSPSC, home dimension of the Stroke-Specific Patient Satisfaction with Care scale; STeleR, Stroke Telerehabilitation; TR, telerehabilitation; TRS, telemedicine rehabilitation system.

[a]WeChat (Tencent Holdings, Ltd., Shenzhen, PRC).

[b]TCMeeting ([Company name], [City], [State or Country]).

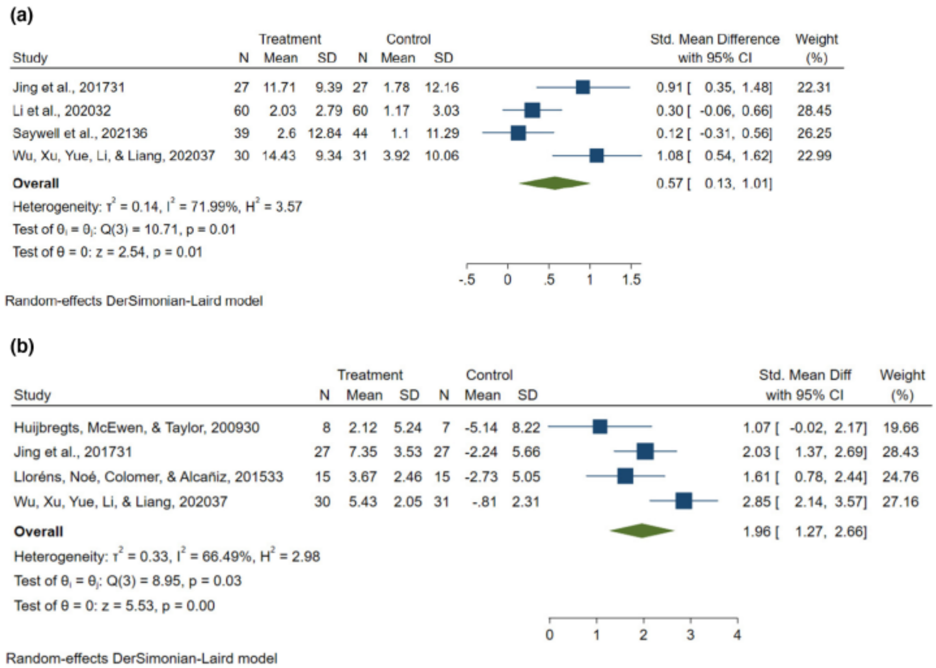

FIGURE 2 Forest plots of the ability (a) to perform activities of daily living, and (b) to maintain balance. CI, confidence interval; N, population; SD, standard deviation; Std. Mean Diff, standard mean difference.

The findings of this systematic review support videoconferencing interventions for stroke survivors as being more effective than conventional care for improving the ability to perform ADLs and to maintain balance. Within the decade of study, videoconferencing was also the most reliable and proven intervention strategy to improve a stroke survivor's ability to perform ADLs in both the acute and post-acute settings (Chen et al., 2017; Li et al., 2020; Saywell et al., 2021; Wu et al., 2020). A recent systematic review also reported that videoconferencing interventions significantly improve 'the performance of ADLs by stroke survivors (Saragih et al., 2021). In line with work by others, these findings suggest that videoconferencing is feasible, acceptable, beneficial, and able to significantly improve the functional performance of stroke survivors (Beit Yosef et al., 2019).

All significant studies on the performance of ADLs were similar, in that the intervention team of professional healthcare providers included physical therapists in their videoconference programs. Several studies have pointed out the benefits of using physical therapists in videoconferencing interventions: (a) They play a critical role in obtaining high adherence rates to exercise, and they provide positive reinforcement, which might help to improve a patient's decision-making processes and sense of wellbeing. (b) The strong relationship they forge with patients can foster a sense of continued support, which might increase a patient's feelings of safety, support, and self-efficacy (Kairy et al., 2013; Seron et al., 2021; Simpson et al., 2020). In videoconferencing, a physical therapist can demonstrate physical exercise, train the patient to perform it correctly, and give necessary audio and visual feedback and encouragement, characteristics similar to those in face-to-face rehabilitation service. Moreover, video conferencing can save travel time, be scheduled at times of mutual convenience, and be conducted on a more flexible schedule under the guidance of the physical therapist. The intensity and the quality of physical rehabilitation through videoconferencing can enable patients to achieve their best performance of ADLs.

After a stroke, 163 participants from four reviewed studies demonstrated significantly improved re-establishment or maintenance of balance through videoconferencing. Participants were reported to have completed the designated training in 45- to 60-min sessions for nine to twelve weeks, as recommended by the U.K. National Institute for Health and Care Excellence's Clinical Guideline 162 (Clark et al., 2017; Dworzynski et al., 2015). Balance is a main focus of stroke rehabilitation because stroke can cause motor disability if balance is not restored; hemiplegia that leads to impaired balance and gait functioning makes the performance of ADLs difficult and can lead to a higher risk of falling (Li et al., 2018; Park et al., 2021). Moreover, the active instruction and monitoring provided by a trained therapist and the participation of the caregiver at home can effectively improve a patient's balance because of an improved feeling of confidence and safety even though the physical therapist is not physically present (Caughlin et al., 2020; Schröder et al., 2019; Wu et al., 2020). Interactive telerehabilitation allows the therapist to remotely monitor the rehabilitation exercise so that patients feel safe, confident, and independent; a collaborative care model based in a telerehabilitation exercise training program can deliver those benefits to stroke survivors (Chen et al., 2021; Wu et al., 2020).

Videoconferencing is a novel telerehabilitation modality with many distinct advantages: it is easily accessible and convenient, it saves time and money, it reduces the burden on caregivers, and it eliminates transportation challenges (Appireddy et al., 2020; Li et al., 2020; Saliba-Gustafsson et al., 2020). Recent studies reported that patients feel more confident and are more satisfied with a videoconference than with a telephone consultation because of the visual cues, reassurances, rapport building, and real-time audiovisual communication that are part of a videoconference (Donaghy et al., 2019; Li et al., 2020). Videoconferences will be a promising and popular stroke telerehabilitation modality in the future because of the benefits for the physical and mental health outcomes of patients.

Our study has several limitations. First, the statistical power of this meta-analysis might be limited by the inclusion of only nine studies. Second, the study interventions were implemented and managed by various categories of healthcare professionals. Third, risk of bias was attached to a lack of blinding for participants and for the therapists who administered the intervention; however, it should be noted that such blinding is usually not feasible for case management studies that focus on individuals with a specific health condition. Fourth, the search strategy for videoconferencing was limited because only that specific MeSH term was used to search the PubMed, CINAHL, and EMBASE databases; using other words might possibly have located additional studies during the search process. Finally, our comprehensive literature search of eight databases identified only nine studies. Relevant studies were identified in other databases such as Psych INFO and Scopus, but could not be included because the title and abstract review showed that they failed to meet the pre-specified inclusion criteria (e.g., participants were not stroke patients, or the telemedicine or telerehabilitation intervention was not videoconferencing).

Overall, our study shows that videoconferencing is a practical intervention for rehabilitation and secondary stroke prevention in stroke survivors. The evidence also implies that videoconferencing interventions significantly improve a survivor's physical status—specifically, balance and ADLs performance. However, further studies are needed to explore the effect of videoconferencing on non-physical rehabilitation such as cognitive and social functioning. Additional large-scale RCTs are therefore necessary to fully understand the effects of videoconferencing interventions on stroke survivors.

5 | CONCLUSIONS

The results of the present review show that videoconferencing is effective for improving the ability of stroke survivors to perform ADLs and maintain balance. Participants in the included studies benefitted from the delivery of videoconferencing. Our findings could contribute to future clinical practice supporting patients post stroke. We suggest that implementation of teleconferencing is an excellent alternative non-pharmacologic approach for improving care for stroke survivors in their homes or long-term care facilities. Developing a standard protocol for the use of videoconferencing in future research will be required.

AUTHOR CONTRIBUTION

Study conception and design: DET, IDS. Data collection: IDS, ISS. Data analysis and interpretation: DET, IDS. Drafting of the article: DET, IDS, HMT. Critical revision of the article: All authors.

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None.

CONFLICT OF INTEREST STATEMENT

The author(s) declare that they have no conflict of interests.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable because no new data were created or analysed in this review.

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