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Research

Home-based exercises are as effective as equivalent doses of centre-based exercises for improving walking speed and balance after stroke: a systematic review

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KEY WORDS

Stroke
Mobility
Gait
Balance
Rehabilitation

ABSTRACT

Questions: In people who have had a stroke, how comparable are the effects of home-based exercises with those of equivalent centre-based exercises for improving walking speed, balance, mobility and participation? Is the comparability of the effects of these two types of exercise maintained beyond the intervention period? **Design**: Systematic review of randomised controlled trials. **Search strategy**: Searches were conducted on MEDLINE, AMED, EMBASE, Cochrane, PsycINFO and PEDro databases, without date or language restrictions. **Participants**: Participants in the reviewed studies were ambulatory adults at any time after stroke. **Interventions**: The experimental intervention consisted of home-based exercises, which was compared with equivalent doses of centre-based exercises. **Outcome measures**: Walking speed, balance, mobility and participation. **Data analysis**: The quality of included trials was assessed using the PEDro scores. Outcome data were extracted from the eligible trials and combined in random-effects meta-analyses. The quality of evidence was determined according to the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system. **Results**: Nine trials involving 609 participants were included. Random-effects meta-analyses provided high-quality evidence that home-based and centre-based exercises provide similar effects on walking speed (MD –0.03 m/s, 95% CI –0.07 to 0.02) and balance (MD 0 points, 95% CI –1 to 2). Results regarding mobility (SMD –0.4, 95% CI –1.3 to 0.4) and participation (MD –5 points, 95% CI –19 to 10) were imprecise. For most outcomes, the effects of home-based exercises and centre-based exercises remained similar beyond the intervention period. **Conclusion**: Effects of home-based prescribed exercises on walking speed, balance, mobility and participation are likely to be similar to improvements obtained by equivalent doses of centre-based exercises after stroke. **Review registration**: PROSPERO (CRD42021254642). **[Nascimento LR, Rocha RJS, Boening A, Ferreira GP, Perovano MC (2022) Home-based exercises are as effective as equivalent doses of centre-based exercises for improving walking speed and balance after stroke: a systematic review. *Journal of Physiotherapy* 68:174–181]**

Introduction

Stroke is one of the leading causes of disability worldwide.[1] Approximately 60% of people who survive stroke cannot walk independently early after stroke[2,3] and those who regain independence may still walk slowly or be unable to cover long distances.[4,5] Balance impairments typically contribute to this reduced walking ability; for example, balance measured by the Berg Balance Scale (0 to 56 points, where a higher score means better balance) is typically 23 points (SD 22) 14 days after stroke and 40 points (SD 18) 90 days after stroke.[6] Those values are correlated with reduced walking and increased risk of falls.[7] In addition, mobility limitations after stroke are not restricted to walking and may include difficulties in standing, turning and sitting.[5]

Many interventions that improve balance, mobility and walking can be implemented broadly.[8,9] However, after hospital discharge, these interventions are typically delivered in rehabilitation centres with direct supervision from physiotherapists. This may contribute to non-adherence to treatment due to lack of motivation, time pressures, transport issues or inability to maintain exercises over a long period of time.[10] Ultimately, non-adherence to prescribed interventions reduces the amount of rehabilitation performed, whereas large amounts are needed to provide a beneficial effect.[11] The delivery of semi-supervised practice (ie, the amount of supervision differs from the amount of prescribed intervention delivered) or remote practice with patients in their homes has emerged as a feasible and safe approach for increasing the amount of rehabilitation and adherence.[12] Exercise that takes place in an informal and flexible setting, typically in patients' homes, can be defined as home-based intervention.[13]

A home-based intervention can provide a feeling of familiarity with the location, which can be very comforting, as well as being

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more accessible, as it reduces the costs, environmental difficulties and time needed to travel to a rehabilitation centre.[14–16] In addition, home-based intervention has been found to induce active participation of families and caregivers, and compensates for the lack of interactions between patients and therapists.[17] Both physiotherapists and patients have reported very positive perceptions of the safety, effectiveness and technological manageability of home-based interventions using videoconferencing.[18] In addition, home-based interventions have been effective for increasing completion rates in clinical trials,[19] and may be useful in periods that require social isolation, such as during the current Covid-19 pandemic. While high-income countries may easily convert centre-based rehabilitation into telerehabilitation, low-to-middle-income countries may have to convert centre-based rehabilitation into in-person home-based intervention. In low-to-middle-income countries, the use of telerehabilitation is limited by: barriers related to the costs of consultations, low education and health literacy; and lack of appropriate infrastructure for access (ie, a smartphone or computer and minimum broadband speed).[20] Regardless of the mode of implementation, home-based interventions must be as effective or superior to centre-based interventions in order to be worthwhile.

Previous systematic reviews[21,22] have suggested that home-based exercises improve overall motor function after stroke, but have provided no information about whether location impacts the effectiveness of prescribed exercise by comparing home-based and centre-based interventions. More recently, a Cochrane review[23] based on two randomised trials of telerehabilitation (ie, remotely supervised home-based intervention) suggested that home-based and centre-based interventions may have similar beneficial effects on activities of daily living (SMD 0, 95% CI −0.2 to 0.2) and mobility (MD 0, 95% CI −0.1 to 0.1). Given that that analysis was constrained to telerehabilitation, a rigorous systematic review with meta-analysis of the current high-quality evidence is warranted.

This systematic review was designed to estimate the effects of home-based exercises relative to centre-based exercises for improving walking and participation after stroke. Any type of home-based exercises were considered, regardless of whether supervision was provided remotely or in-person. Only trials that compared home-based and centre-based exercises of similar doses were included. The outcomes that were examined included effects on clinically relevant walking outcomes and their carryover effects to participation.

Therefore, the specific research questions for this systematic review were:

1. In people who have had a stroke, how comparable are the effects of home-based exercises to those of equivalent centre-based exercises for improving walking speed, balance, mobility and participation?
2. Is the comparability of the effects of these two types of exercise maintained beyond the intervention period?

Method

This systematic review is reported according to the guidelines on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement.[24]

Identification and selection of trials

Searches were conducted on MEDLINE, AMED, EMBASE, Cochrane, PsycINFO and PEDro databases, until March 2022, for relevant studies without date or language restrictions. The search strategy was registered at PubMed/Medline, so the authors received monthly notifications with potential papers related to this systematic review. Search terms included words related to *stroke*, *home-based interventions* and *randomised trials* (see Appendix 1 on the eAddenda for the full search strategy). Titles and abstracts were displayed and screened to identify relevant studies. The method section of the retrieved papers was extracted and reviewed independently by two reviewers (GPF and MCP) using predetermined criteria (Box 1). Both reviewers were blinded to titles, dates, authors, journals and results. Disagreement or ambiguities were resolved by consensus after discussion with a third reviewer (LRN).

Assessment of characteristics of trials

Quality

The methodological quality of the included trials was assessed by extracting the PEDro scores from the Physiotherapy Evidence Database (www.pedro.org.au). The PEDro scale is an 11-item scale designed for rating the methodological quality (internal validity and statistical information) of randomised trials. Each item, except for the Item 1, contributes 1 point to the total score (range 0 to 10 points). Where a trial was not included on the database, it was scored by a reviewer who had completed the PEDro scale training tutorial.

Participants

Trials involving adults at any time following stroke were included. The number of participants, age, time since stroke and baseline walking speed were recorded to assess the similarity of the studies.

Intervention

Trials were included if the experimental intervention was home-based and consisted of structured and repetitive exercises targeting the paretic lower limb for improving standing and/or walking. Home-based was defined as two-thirds of the exercise being conducted at home. To be included, a minimum dose of four sessions over $\geq$ 2 weeks, prescribed by a physiotherapist or health professional with a degree-level qualification in exercise prescription was required.[25] Trials were excluded if the home-based exercises were designed as a sham or control with no potential therapeutic benefit. Trials were included when the control group received an equivalent dose of centre-based exercises, being provided at a centre, such as hospital, outpatient department, private practice, medical centre or community centre. Session duration, session frequency and program duration were recorded to assess the similarity of the studies.

Outcome measures

Four outcomes were of interest: walking speed, balance, mobility and participation. The measurement of walking speed (typically obtained using a timed walk test) had to be reported as a relation of distance and time. The measurement of balance had to be representative of the ability to maintain a controlled body position during an activity (eg, Berg Balance Scale).[26] The measurement of mobility had to be representative of the ability to change body position or location and move (eg, Timed Up and Go test). The measurement of participation had to be reported by questionnaires that included questions regarding the individual's ability to perform activities in real-life situations (eg, Stroke Impact Scale or Assessment of Life

Box 1. Inclusion criteria.

Design
- Randomised controlled trials

Participants
- Adults (> 18 years)
- Stroke

Intervention
- Home-based exercise
- $\geq$ four sessions over $\geq$ 2 weeks
- $\geq$ two-thirds of the exercise is performed at home
- Prescribed by physiotherapist or health professional

Outcomes measures
- Measures of walking speed, balance, mobility or participation

Comparison
- Home-based exercise versus equivalent dose of centre-based exercise

Habits – LIFE-H or Reintegration to Normal Living Index).[27] The timing of the measurements and the procedure used to measure the outcomes were recorded to assess the appropriateness of combining studies in a meta-analysis.

Data analysis

Information about the method (ie, design, participants, intervention and measures) and results (ie, number of participants and means (SD) of outcomes related to walking, balance, mobility and participation) were extracted by two reviewers (MCP and RJSR) and checked by two reviewers (LRN and GPF). Where information was unavailable in the published trials, details were requested from the corresponding author.

The post-intervention or change scores were used to obtain the pooled estimate of the effect of the intervention, using a random-effects model. A visual inspection of the distribution of effect sizes in the forest plots was performed and the I^2 value was calculated to indicate the proportion of variance that was due to heterogeneity. Values of $I^2 > 50\%$ are indicative of important heterogeneity.[28,29] The analyses were performed using Review Manager software[a]. The pooled data for each outcome were reported as weighted or standardised mean differences between the groups and their 95% CI. Where data from a trial could not be included in a pooled analysis, the between-group difference and, where possible, its 95% CI were reported.

The Grading of Recommendations Assessment, Development and Evaluation (GRADE) system was used to summarise the overall quality of evidence for each outcome. The GRADE system ranges from high to very low quality.[30] This review rated evidence starting at the high-quality level and downgraded it 1 point whenever one of the following prespecified criteria was present: low methodological quality (defined as > 50% of trials with PEDro score < 6); inconsistency of estimates among pooled studies ($I^2 > 50\%$) or when estimation was not possible (no pooling); indirectness of participants (defined as > 50% of trials not reporting time since stroke or baseline walking speed); and imprecision (pooling < 300 participants per outcome).[4] Two reviewers (RJSR and MCP) assessed the quality of the evidence using the GRADE system, with potential disagreements resolved by discussion with a third reviewer (LRN).

Results

Flow of trials through the review

The electronic search strategy identified 3,856 papers. After screening titles and abstracts, 47 potentially relevant, full-text papers were retrieved. Thirty-eight papers failed to meet the inclusion criteria (see Appendix 2 on the eAddenda for a summary of the excluded papers); therefore, nine papers were included in the review. Flow of studies through the review is presented in Figure 1.

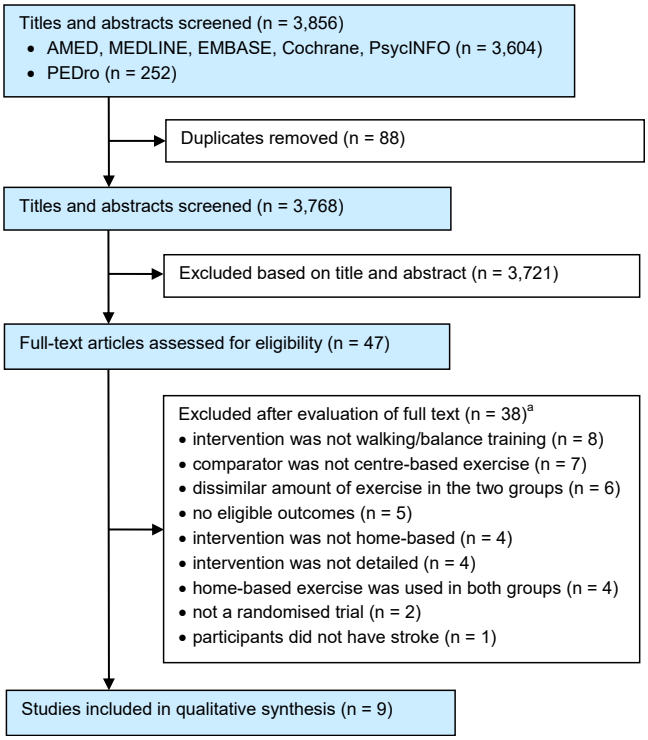

Figure 1. Flow of trials through the review.
[a]Trials may have been excluded for failing to meet more than one inclusion criterion.

Characteristics of included trials

The nine trials involved 609 participants and investigated the effects of home-based exercises for improving walking speed (n = 6),[31–36] balance (n = 6),[29,32,34,35–37] mobility (n = 4)[30,31,34,37] and participation (n = 1)[34] after stroke. Detailed information is provided in Table 1. Additional information was requested from the authors of three papers[31,32,36] and received from one author.[32]

Quality

The mean PEDro score of the trials was 6.4 (range 4 to 8). PEDro criteria and scores for the included trials are presented in Table 2. All trials randomly allocated the participants, had similar groups at baseline and reported between-group differences. Eight trials reported a point estimate and variability, seven had blinded assessors, and six had < 15% dropouts and reported whether an intention-to-treat analysis was undertaken. Four trials reported use of concealed allocation and no trials blinded the participants and therapists, which is difficult for complex interventions.

Participants

The mean age of participants ranged from 54 to 70 years old across trials. Four trials[31,32,34,38] included participants in the acute post-stroke phase, four trials[33,34,36,39] in the chronic phase and one trial[37] in both acute and chronic phases on admission to the trial. The mean baseline walking speed ranged from 0.3 to 0.9 m/s across trials, but three trials[37–39] did not report the participants' baseline walking speed.

Intervention

The experimental intervention in all trials was home-based. Participants undertook training for 30 to 120 minutes, three times per week (SD 1), for 9 weeks (SD 3). Three trials delivered interventions to improve impairments (eg, strength and balance training),[31,35,37] two trials delivered task-oriented training,[32,33] one trial delivered Bobath therapy combined with task-oriented training and electrical stimulation,[38] one trial delivered virtual-reality training[39] and two trials delivered interventions to improve impairments combined with task-oriented training.[34,36] Seven trials provided supervised interventions[31–34,36,38,39] and two trials provided unsupervised interventions combined with phone or written instructions.[35,37] Among trials that provided supervised interventions, the participants had in-person supervision in five trials,[31–34,36] remote supervision in one trial[39] and both in-person and remote supervision in one trial.[38] Supervision was predominantly provided by physiotherapists. The control groups received equivalent doses of centre-based exercises, predominantly delivered in rehabilitation clinics. Modes of exercise delivered to control groups were the same as those delivered to the experimental groups; however, two trials[31,36] used robotic devices unavailable for home-based interventions.

Outcome measures

Six trials[31–36] measured walking speed using a timed walk measure, reported in m/s. Six trials measured balance using a standardised scale: four trials[31,37–39] used the Berg Balance Scale, one trial[32] used the Postural Assessment Scale for Stroke and one trial[34] used the Short-form Assessment Scale for Stroke. Three trials[32,33,36] measured mobility using a timed test (ie, Timed Up and Go or Sit to

Table 1
Characteristics of the included trials (n = 9).

Study	Participants	Intervention		Outcome measures
		Frequency and duration	Characteristics	
Altin et al (2009)[37]	n = 20 Age *(y)* = 62 (10) Time since stroke *(mth)* = 3 to 24 Walking speed *(m/s)* = NR Acute and chronic phase	Exp = home-based exercises 60 min x 3/wk x 12 wk Con = centre-based exercises 60 min x 3/wk x 12 wk	Intervention = strength, balance, mobility and coordination training Amount of supervision (%) = 0 Supervisor = not provided Type of supervision = not provided Encouragement = weekly phone call Progression = increased repetitions	Balance = BBS *(0 to 56)* Mobility = RMI *(0 to 15)* Timing: 0, 12, 48 wk
Chen et al (2017)[38]	n = 54 Age *(y)* = 66 (12) Time since stroke *(mth)* = 1 (5) Walking speed *(m/s)* = NR Acute phase	Exp = home-based exercises 80 min x 2/wk x 12 wk Con = centre-based rehabilitation 80 min x 2/wk x 12 wk	Intervention = Bobath therapy, proprioceptive neuromuscular facilitation, balance and walking training and electrical stimulation Amount of supervision (%) = 100 Supervisor = physiotherapist and caregiver Encouragement = NR Type of supervision = in-person and remote Progression = NR	Balance = BBS *(0 to 56)* Timing: 0, 12, 24 wk
Duncan et al (2011)[31]	n = 265 Age *(y)* = 61 (13) Time since stroke *(mth)* = 2 (0.2) Walking speed *(m/s)* = 0.38 (0.22) Acute phase	Exp = home-based exercises 90 min x 3/wk x 12 wk Con = centre-based treadmill training 90 min x 3/wk x 12 wk	Intervention = strength, balance, coordination and flexibility training Amount of supervision (%) = 100 Supervisor = physiotherapist Type of supervision = in-person Encouragement = orientation to walk daily Progression = increased velocity in treadmill training	Walking speed = 10MWT *(m/s)* Balance = BBS *(0 to 56)* Timing: 0, 12, 40 wk
Gjelsvik et al (2014)[32]	n = 70 Age *(y)* = 70 (13) Time since stroke *(mth)* = NR Walking speed *(m/s)* = 0.90 (0.40) Acute phase	Exp = home-based exercises 120 min x 2/wk x 5 wk Con = centre-based exercises 120 min x 2/wk x 5 wk	Intervention = task-oriented training Amount of supervision (%) = 100 Supervisor = physiotherapist and occupational therapist Type of supervision = in-person Encouragement = NR Progression = NR	Walking speed = 5MWT *(m/s)* Balance = PASS *(0 to 36)* Mobility = TUG *(s)* Timing: 0, 12 wk
Hsieh et al (2018)[33]	n = 24 Age *(y)* = 54 (18) Time since stroke *(mth)* = 14 (12) Walking speed *(m/s)* = 0.59 (0.23) Chronic phase	Exp = home-based exercises 75 to 105 min x 3/wk x 4 wk Con = centre-based exercises 75 to 105 min x 3/wk x 4 wk	Intervention = mirror therapy and task-oriented training Amount of supervision (%) = 100 Supervisor = therapist (not specified) Type of supervision = in-person Encouragement = verbal instructions Progression = NR	Walking speed = 10MWT *(m/s)* Mobility = Sit-To-Stand Test *(repetitions in 30 s)* Timing: 0, 4 wk
Lloréns et al (2015)[39]	n = 30 Age *(y)* = 55 (8) Time since stroke *(mth)* = 27 Walking speed *(m/s)* = NR Chronic phase	Exp = home-based exercises (virtual reality) 45 min x 3/wk x 6 wk Con = centre-based rehabilitation 45 min x 3/wk x 6 wk Both = conventional rehabilitation	Intervention = virtual reality-based exercises for walking and balance Amount of supervision (%) = 100 Supervisor = physiotherapist Type of supervision = remote Encouragement = NR Progression = increased difficulty	Balance = BBS *(0 to 56)* Timing: 0, 8, 12 wk
Olaleye et al (2014)[34]	n = 52 Age *(y)* = 61 (9) Time since stroke *(mth)* = 1 Walking speed *(m/s)* = 0.3 (0.35) Acute phase	Exp = home-based rehabilitation 45 to 60 min x 2/wk x 10 wk Con = centre-based exercises 45 to 60 min x 2/wk x 10 wk	Intervention = strength, balance, task-oriented training Amount of supervision (%) = 100 Supervisor = physiotherapist Type of supervision = in-person Encouragement = NR Progression = increased resistance and intensity	Walking speed = 6MWT *(m/s)* Balance = SF-PASS *(0 to 15)* Participation = RNLI *(0 to 110)* Timing: 0, 10 wk
Olney et al (2006)[35]	n = 72 Age *(y)* = 64 (12) Time since stroke *(mth)* = 43 (49) Walking speed *(m/s)* = 0.74 (0.34) Chronic phase	Exp = home-based exercises 90 min x 3/wk x 9 wk Con = centre-based exercises 90 min x 3/wk x 9 wk Both = supervised physical conditioning program	Intervention = aerobic and strength training Amount of supervision (%) = 0 Supervisor = not provided Type of supervision = not provided Encouragement = written and verbal instructions for progression Progression = increased walking intensity and duration wkly	Walking speed = 6mWT *(m/s)* Timing: 0, 10, 24 wk

Table 1 (*Continued*)

Study	Participants	Intervention		Outcome measures
		Frequency and duration	Characteristics	
Uçar et al (2014)[36]	n = 22 Age *(y)* = 57 (8) Time since stroke *(mth)* = 12 Walking speed *(m/s)* = 0.64 Chronic phase	Exp = home-based exercises 30 min x 5/wk x 2 wk Con = centre-based robotic exercises 30 min x 5/wk x 2 wk	Intervention = Strength, balance, task-oriented training Amount of supervision (%) = 100 Supervisor = physiotherapist Type of supervision = in-person Encouragement = biofeedback of performance Progression = decreased amount of assistance	Walking speed = 10MWT *(m/s)* Mobility = TUG *(s)* Timing: 0, 2, 8 wk

Listed groups and outcome measures are those that were analysed in this systematic review; there may have been other groups or measures in the paper. Participant characteristics are presented as mean (SD) or range.
BBS = Berg Balance Scale, Con = control group, CT = controlled trial, Exp = experimental group, RCT = randomised controlled trial, RMI = Rivermead Mobility Index, NR = not reported, RNLI = Reintegration to Normal Living Index, PASS = Postural Assessment Scale for Stroke, SF-PASS = Short Form-Postural Assessment Scale for Stroke, TUG = Timed Up and Go Test, 10MWT = 10-Metre Walk Test, 5MWT = 5-Metre Walk Test, 6mWT = 6-Minute Walk Test, 6MWT = 6-Metre Walk Test.

Table 2
PEDro scores for the included trials (n = 9).

Study	Random allocation	Concealed allocation	Groups similar at baseline	Participant blinding	Therapist blinding	Assessor blinding	< 15% lost to follow-up	Intention-to-treat analysis	Between-group difference reported	Point estimate and variability reported	Total (0 to 10)
Altin et al (2009)[37]	Y	N	Y	N	N	N	Y	Y	Y	Y	6
Chen et al (2017)[38]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Duncan et al (2011)[31]	Y	N	Y	N	N	Y	Y	Y	Y	Y	7
Gjelsvik et al (2014)[32]	Y	Y	Y	N	N	Y	N	Y	Y	Y	7
Hsieh et al (2018)[33]	Y	N	Y	N	N	Y	N	N	Y	Y	5
Lloréns et al (2015)[39]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Olaleye et al (2014)[34]	Y	N	Y	N	N	Y	Y	N	Y	Y	6
Olney et al (2006)[35]	Y	Y	Y	N	N	N	Y	Y	Y	Y	7
Uçar et al (2014)[36]	Y	N	Y	N	N	Y	N	N	Y	N	4

N = no, Y = yes.

Stand) and one trial[37] used the Rivermead Mobility Index. One trial[34] measured participation using the Reintegration to Normal Living Index.

Effect of home-based exercises relative to centre-based exercises

Walking speed

The effect of home-based exercises compared with centre-based exercises on walking speed was examined by pooling outcomes from six trials[31–36] involving 499 participants. The mean difference was –0.03 m/s (95% CI –0.07 to 0.02, I^2 = 0), which indicates that home-based exercises and centre-based exercises provided similar effects on walking speed (Figure 2). The quality of the evidence was rated as high. The effects of home-based exercises and centre-based exercises remained similar beyond the intervention period (two trials, MD 0.02 m/s, 95% CI –0.02 to 0.07, I^2 = 0) (Figure 3). For more detailed forest plots, see Figures 4 and 5 on the eAddenda.

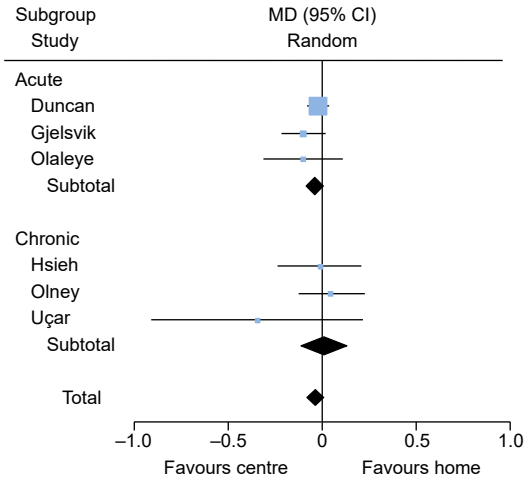

Figure 2. Mean difference (95% CI) of home-based versus centre-based exercises for walking speed *(m/s)* immediately after the intervention period.

Effect on balance

The effect of home-based exercises compared with centre-based exercises on balance was examined by pooling outcomes from four trials[31,37-39] involving 369 participants. The mean difference on Berg Balance Scale (0 to 56 points) was 0 (95% CI –1 to 2, I^2 = 40%), which indicates that home-based exercises and centre-based exercises provide similar effects on balance (Figure 6). The quality of the evidence was rated as high. Two additional trials[32,34] involving 122 participants measured balance using other scales and also reported no clear difference between home-based exercises and centre-based exercises (SMD –0.1, 95% CI –0.4 to 0.3, I^2 = 0, meta-analysis not shown). The effects of home-based exercises and centre-based exercises remained similar beyond the intervention period (four trials, MD 0 points on Berg Balance Scale, 95% CI –1 to 2, I^2 = 0) (Figure 7). For more detailed forest plots, see Figures 8 and 9 on the eAddenda.

Effect on mobility

The effect of home-based exercises compared with centre-based exercises on mobility was examined by pooling outcomes from three trials[33,36,37] involving 66 participants. The standardised mean difference was –0.4 in favour of centre-based exercises; however, the estimate was imprecise (95% CI –1.3 to 0.4, I^2 = 66%), which made it unclear whether home-based exercises and centre-based exercises provide similar effects on mobility (Figure 10). For a more detailed forest plot, see Figure 11 on the eAddenda. The quality of the evidence was rated as very low. One additional trial[32] involving 78 participants provided change scores for mobility and also reported a negligible difference between home-based exercises and centre-based exercises (MD 0 seconds, 95% CI 0 to 0.1). A negligible effect on mobility was observed beyond the intervention period in favour of centre-based

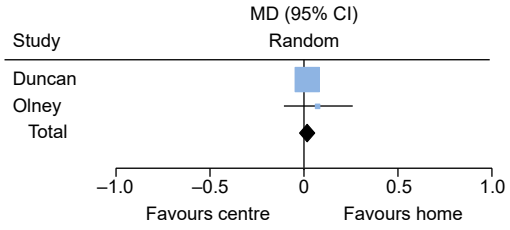

Figure 3. Mean difference (95% CI) of home-based versus centre-based exercises for walking speed *(m/s)* beyond the intervention period.

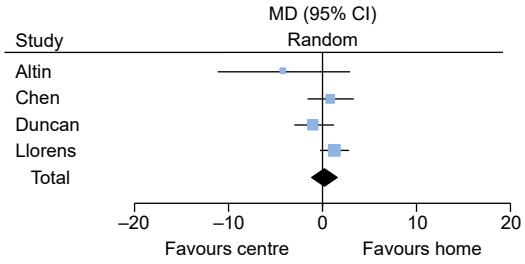

Figure 6. Mean difference (95% CI) of home-based versus centre-based exercises on Berg Balance Scale (0 to 56 points) immediately after the intervention period.

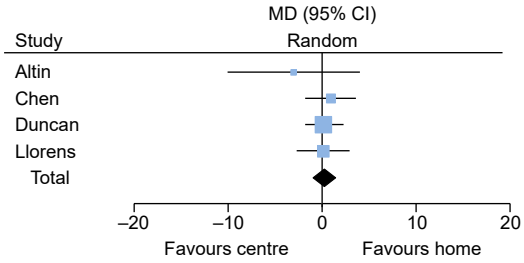

Figure 7. Mean difference (95% CI) of home-based versus centre-based exercises on Berg Balance Scale (0 to 56 points) beyond the intervention period.

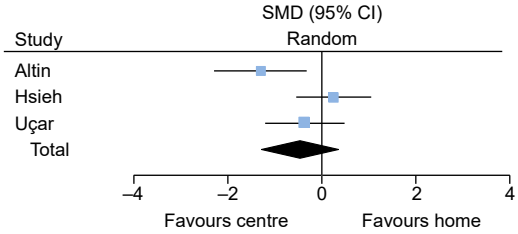

Figure 10. Standardised mean difference (95% CI) of home-based versus centre-based exercises for mobility immediately after the intervention period.

exercises (one trial, MD –1 point on Rivermead Mobility Index, 95% CI –2 to 0).

Effect on participation

The effect of home-based exercises compared with centre-based exercises on participation was examined by one trial[34] involving 52 participants. The mean difference was –5 points on the Reintegration to Normal Living Index (95% CI –19 to 10), which indicated that home-based exercises and centre-based exercises may have similar effects on participation. The quality of the evidence was rated as low. No trials compared the long-term effects on participation.

Discussion

This systematic review provided high-quality evidence that home-based prescribed exercises are as effective as centre-based exercises for improving walking speed and balance after stroke. Very low to low-quality evidence suggested that effects on mobility and participation are also similar. The review included nine trials that directly compared home-based exercises and centre-based exercises of equivalent dose, ensuring that the results can be attributed primarily to location. The similarity in effects was maintained beyond the intervention period, which should be interpreted cautiously due to the small number of trials.

This is the first review to compare the effects of home-based and centre-based exercises on clinically relevant walking outcomes and participation after stroke; therefore, comparison with previous results is challenging. The results from a Cochrane review[23] suggested that home-based and centre-based interventions provide similar benefits, but the conclusions were based on two trials of telerehabilitation. This review strengthens previous evidence because the conclusions were based on nine randomised trials of moderate quality, the inclusion of home-based interventions regardless of the type of supervision, and the measurement of walking speed. Measurements of walking speed are recommended in all stroke recovery trials[40] as the results predict independence[41] and community ambulation.[42] There was some clinical heterogeneity related to the characteristics of intervention: the amount and type of supervision varied among trials; however, it did not appear to influence the results. A previous systematic review suggested that benefits from home-based rehabilitation are not affected by slight changes in intervention such as the use of technology and/or assistive devices in providing motivation.[43] However, the current review did not perform subgroup analyses based on types of supervision and exercises, due to the small number of trials included.[44]

The experimental and control groups were homogeneous regarding the doses of intervention. Trials were only included when the centre-based group practised equivalent doses of exercise compared with the home-based group. Therefore, the results suggest that it is not the location of the intervention that is important, but the amount of practice. These results are in accordance with a systematic review that found no differences in home-based and centre-based interventions in Parkinson's disease.[25] In addition, the GRADE system of assessing the evidence suggested that two outcomes examined in the current review were credible (ie, they provided high-quality evidence). The main reason that mobility and participation were rated as (very) low-quality evidence was the low number of trials, the low number of participants included in the pooled analyses and the statistical heterogeneity among trials. However, because the mean difference and the confidence intervals were close to zero, which indicated no clear evidence in favour of either intervention, it is unlikely that further trials would change the overall results. Therefore, home-based prescribed exercises may be useful for patients who need to increase the amount of practice over a long period of time or are confined to their homes in the ongoing pandemic due to COVID-19. It is important to highlight that the home-based interventions were predominantly monitored either remotely or in person, which suggests that regular contact with a physiotherapist is important for ensuring the success of the home-based treatment.

This review had both strengths and limitations. The external validity of the review was improved by the included trials having participants in both acute and chronic phases after stroke, and the level of walking speed ranging from 0.3 to 0.9 m/s, which covers the spectrum of walking disability. The preliminary observational analysis suggested that both acute and chronic participants may benefit from home-based or centre-based exercises similarly; however, according to Cochrane recommendations, more trials are required for robust subgroup analyses based on time since stroke. The experimental interventions were mostly reported according to the Template for Intervention Description and Replication (TIDIeR)[45] in terms of session duration, session frequency and program duration; however, some trials failed to describe the type and progression of the exercises. Because only trials of equivalent doses of home-based and centre-based interventions were compared, the results support the

rationale that location does not interfere with the effects on walking and balance abilities. This allows clinicians to consider the best location for intervention based on the patient's preference and available resources. On the other hand, for the measurements of mobility, the pooled effect was calculated using the standardised mean difference, which is less clinically meaningful than a mean difference. In addition, five of the six trials included in the meta-analysis of the primary outcome provided full in-person supervision, which precluded conclusions based on type or amount of supervision. Further studies are warranted to clarify if partially supervised home-based interventions are as effective as fully supervised interventions, as this may have implications for the economies and practicalities of service delivery. Lastly, few trials measured participation or reported outcomes in the longer term, leading to inconclusive results.

In conclusion, this review provides evidence that the effects of home-based prescribed exercises on walking speed and balance are likely to be similar to improvements obtained by equivalent doses of centre-based exercises. This suggests that home-based prescribed exercises may be an effective strategy for delivering high-quality exercise to people after stroke in health services where adherence to centre-based exercises is unsuccessful or in periods that require social isolation.

What was already known on this topic: Mobility impairment is common in people who have had a stroke and balance impairment may contribute to this reduced walking ability. Large amounts of rehabilitation are required to provide benefits and home-based semi-supervised practice is a feasible and safe option to facilitate this.

What this study adds: Home-based prescribed exercises produced improvements in walking speed, balance, mobility and participation that were similar to those obtained by equivalent doses of centre-based exercises after stroke. Beyond the intervention period, home-based and centre-based exercises had similar effects.

Footnotes: [a] Review Manager V.5.3, The Nordic Cochrane Centre, Copenhagen, Denmark

eAddenda: Figures 4, 5, 8, 9 and 11, and Appendices 1 and 2 can be found online at https://doi.org/10.1016/j.jphys.2022.05.018

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