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Trunk training following stroke (Review)

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TABLE OF CONTENTS

[Intervention Review]

Trunk training following stroke

Liselot Thijs[1], Eline Voets[2], Stijn Denissen[3,4], Jan Mehrholz[5], Bernhard Elsner[5], Robin Lemmens[6,7,8], Geert SAF Verheyden[1]

[1]Department of Rehabilitation Sciences, KU Leuven, Leuven, Belgium. [2]Department of Neurorehabilitation, KU Leuven, Leuven, Belgium. [3]AIMS lab, Center for Neurosciences, UZ Brussel, Vrije Universiteit Brussel, Brussels, Belgium. [4]icometrix, Leuven, Belgium. [5]Department of Public Health, Dresden Medical School, Technical University Dresden, Dresden, Germany. [6]Department of Neurosciences, Experimental Neurology, KU Leuven, Leuven, Belgium. [7]Center for Brain & Disease Research, Laboratory of Neurobiology, VIB, Leuven, Belgium. [8]Department of Neurology, University Hospitals Leuven, Leuven, Belgium

Contact: Geert SAF Verheyden, geert.verheyden@faber.kuleuven.be.

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ABSTRACT

Background

Previous systematic reviews and randomised controlled trials have investigated the effect of post-stroke trunk training. Findings suggest that trunk training improves trunk function and activity or the execution of a task or action by an individual. But it is unclear what effect trunk training has on daily life activities, quality of life, and other outcomes.

Objectives

To assess the effectiveness of trunk training after stroke on activities of daily living (ADL), trunk function, arm-hand function or activity, standing balance, leg function, walking ability, and quality of life when comparing with both dose-matched as non-dose-matched control groups.

Search methods

We searched the Cochrane Stroke Group Trials Register, CENTRAL, MEDLINE, Embase, and five other databases to 25 October 2021. We searched trial registries to identify additional relevant published, unpublished, and ongoing trials. We hand searched the bibliographies of included studies.

Selection criteria

We selected randomised controlled trials comparing trunk training versus non-dose-matched or dose-matched control therapy including adults (18 years or older) with either ischaemic or haemorrhagic stroke. Outcome measures of trials included ADL, trunk function, arm-hand function or activity, standing balance, leg function, walking ability, and quality of life.

Data collection and analysis

We used standard methodological procedures expected by Cochrane.

Two main analyses were carried out. The first analysis included trials where the therapy duration of control intervention was non-dose-matched with the therapy duration of the experimental group and the second analysis where there was comparison with a dose-matched control intervention (equal therapy duration in both the control as in the experimental group).

Main results

We included 68 trials with a total of 2585 participants.

In the analysis of the non-dose-matched groups (pooling of all trials with different training duration in the experimental as in the control intervention), we could see that trunk training had a positive effect on ADL (standardised mean difference (SMD) 0.96; 95% confidence interval (CI) 0.69 to 1.24; P < 0.001; 5 trials; 283 participants; very low-certainty evidence), trunk function (SMD 1.49, 95% CI 1.26 to 1.71; P < 0.001; 14 trials, 466 participants; very low-certainty evidence), arm-hand function (SMD 0.67, 95% CI 0.19 to 1.15; P = 0.006; 2 trials, 74 participants; low-certainty evidence), arm-hand activity (SMD 0.84, 95% CI 0.009 to 1.59; P = 0.03; 1 trial, 30 participants; very low-certainty evidence), standing balance (SMD 0.57, 95% CI 0.35 to 0.79; P < 0.001; 11 trials, 410 participants; very low-certainty evidence), leg function (SMD 1.10, 95% CI 0.57 to 1.63; P < 0.001; 1 trial, 64 participants; very low-certainty evidence), walking ability (SMD 0.73, 95% CI 0.52 to 0.94; P < 0.001; 11 trials, 383 participants; low-certainty evidence) and quality of life (SMD 0.50, 95% CI 0.11 to 0.89; P = 0.01; 2 trials, 108 participants; low-certainty evidence). Non-dose-matched trunk training led to no difference for the outcome serious adverse events (odds ratio: 7.94, 95% CI 0.16 to 400.89; 6 trials, 201 participants; very low-certainty evidence).

In the analysis of the dose-matched groups (pooling of all trials with equal training duration in the experimental as in the control intervention), we saw that trunk training had a positive effect on trunk function (SMD 1.03, 95% CI 0.91 to 1.16; P < 0.001; 36 trials, 1217 participants; very low-certainty evidence), standing balance (SMD 1.00, 95% CI 0.86 to 1.15; P < 0.001; 22 trials, 917 participants; very low-certainty evidence), leg function (SMD 1.57, 95% CI 1.28 to 1.87; P < 0.001; 4 trials, 254 participants; very low-certainty evidence), walking ability (SMD 0.69, 95% CI 0.51 to 0.87; P < 0.001; 19 trials, 535 participants; low-certainty evidence) and quality of life (SMD 0.70, 95% CI 0.29 to 1.11; P < 0.001; 2 trials, 111 participants; low-certainty evidence), but not for ADL (SMD 0.10; 95% confidence interval (CI) -0.17 to 0.37; P = 0.48; 9 trials; 229 participants; very low-certainty evidence), arm-hand function (SMD 0.76, 95% CI -0.18 to 1.70; P = 0.11; 1 trial, 19 participants; low-certainty evidence), arm-hand activity (SMD 0.17, 95% CI -0.21 to 0.56; P = 0.38; 3 trials, 112 participants; very low-certainty evidence). Trunk training also led to no difference for the outcome serious adverse events (odds ratio (OR): 7.39, 95% CI 0.15 to 372.38; 10 trials, 381 participants; very low-certainty evidence).

Time post stroke led to a significant subgroup difference for standing balance (P < 0.001) in non-dose-matched therapy. In non-dose-matched therapy, different trunk therapy approaches had a significant effect on ADL (< 0.001), trunk function (P < 0.001) and standing balance (< 0.001).

When participants received dose-matched therapy, analysis of subgroup differences showed that the trunk therapy approach had a significant effect on ADL (P = 0.001), trunk function (P < 0.001), arm-hand activity (P < 0.001), standing balance (P = 0.002), and leg function (P = 0.002). Also for dose-matched therapy, subgroup analysis for time post stroke resulted in a significant difference for the outcomes standing balance (P < 0.001), walking ability (P = 0.003) and leg function (P < 0.001), time post stroke significantly modified the effect of intervention.

Core-stability trunk (15 trials), selective-trunk (14 trials) and unstable-trunk (16 trials) training approaches were mostly applied in the included trials.

Authors' conclusions

There is evidence to suggest that trunk training as part of rehabilitation improves ADL, trunk function, standing balance, walking ability, upper and lower limb function, and quality of life in people after stroke. Core-stability, selective-, and unstable-trunk training were the trunk training approaches mostly applied in the included trials. When considering only trials with a low risk of bias, results were mostly confirmed, with very low to moderate certainty, depending on the outcome.

PLAIN LANGUAGE SUMMARY

Trunk training for improving activities in people with stroke

Background

Stroke is a common condition that can lead to major disabilities and even death in adults. Stroke has an important impact on various aspects of human functioning, including limiting movement. One frequently observed deficit after stroke is the reduced functioning of the torso of the body. This impairment can, amongst other things, be characterised by reduced mobility, reduced sitting balance, late or reduced reactions to internal and external disturbances, reduced muscle strength and muscle activation patterns of the torso. Movements of the torso and sitting balance are both important for functional independence - that is, the ability to perform daily living tasks such as dressing, eating, and grooming without help. Functioning of the torso can largely forecast the level of recovery and independence after a stroke.

Trunk training aims to regain function of the torso. Trunk training can consist of different elements, such as: strength training of the abdominal and back muscles; exercises that focus on improving the mobility of the torso; or improving lateral or forward balance while sitting, aimed at improving sitting balance.

The torso is the core of the body; it provides a stable basis for control over and movements of the head and extremities. Training of the torso may have a positive effect not only on the functioning of the torso, but also an impact on other outcomes such as activities of daily living, standing balance, walking, and well-being.

Review question

We wanted to find out if training of the torso improves people's activities of daily living, trunk function, standing balance, well-being, and other outcomes, after they have had a stroke.

Search date

We searched nine databases and hand searched the bibliographies of relevant studies published up to 25 October 2021.

Study characteristics

We included 68 studies in which participants were randomly divided into two or more groups, with a total of 2585 participants. The studies compared training of the torso with other therapy or no therapy after a stroke.

Key results

We found that training of the torso may result in improvements of activities of daily living, torso function, standing balance, functional use of the affected arm and hand, movements of the affected lower limb, the ability to walk, and well-being.

Quality of the evidence

The quality of the evidence was very low to low.

Summary of findings 1. Summary of findings (Non-dose-matched therapy in the control group)

Trunk training compared with control intervention for people after stroke

Patient or population: participants after stroke

Settings: hospital, clinic, inpatient rehabilitation centre

Intervention: all types of trunk training

Comparison: non dose-matched therapy

Outcomes	Outcome measures	Anticipated absolute effect (95% CI)*	No of participants (studies)	Certainty of the evidence (GRADE)	Comments
Activities of daily living (primary outcome)	- (modified) Barthel Index - Functional Independence Measure	SMD 0.96 **SD higher** (0.69 higher to 1.24 higher) Analysis 1.1	283 (5 RCTs)	⊕◯◯◯ VERY LOW[a,b,f]	
Trunk function	- Trunk Impairment Scale 1.0 & 2.0 - Modified function range - Trunk Control Test	SMD **1.49 SD higher** (1.26 higher to 1.71 higher) Analysis 1.2	466 (14 RCTs)	⊕◯◯◯ VERY LOW[a,g,l]	
Arm-hand activity	- Rivermead Motor Assessment-Arm Scale - Manual Function Test - Wolf Motor Function Test	SMD **0.84 SD higher** (0.09 higher to 1.59 higher) Analysis 1.4	30 (1 RCT)	⊕◯◯◯ VERY LOW[a,c,k]	
Standing balance	- Berg Balance Scale - Functional Reach Test - Tinetti Scale - Brunel Balance Assessment	SMD **0.57 SD higher** (0.35 higher to 0.79 higher) Analysis 1.5	410 (11 RCTs)	⊕◯◯◯ VERY LOW[a,d,e]	
Walking ability	- 10-Meter Timed Walk Test - Walking speed - Timed Up and Go Test	SMD **0.73 SD higher** (0.52 higher to 0.94 higher) Analysis 1.7	383 (11 RCTs)	⊕◯◯◯ VERY LOW[a,e,j]	

	- Tinetti Scale - 6-Meter Walk Test - Wisconsin Gait Scale			
Quality of life after stroke	- Stroke Impact Scale 2.0 - Short Form-36 - European Quality of Life - Stroke-Specific Quality of Life scale	SMD **0.5 SD higher** (0.11 higher to 0.89 higher) Analysis 1.8	108 (2 RCTs)	⊕◯◯◯ VERY LOW[a,e,h]
Death and serious adverse events, including falls	- Number of falls - Number of serious adverse events	Relative effect (95% CI) **OR 7.94** (0.16 to 400.89) Analysis 1.9	201 (6 RCTs)	⊕◯◯◯ VERY LOW[a,e,i]

*The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the relative effect of the intervention (and its 95% CI).
CI: confidence interval; **OR:** odds ratio; **RCT:** randomised controlled trials; **SD:** standard deviation; **SMD:** standardised mean differences

GRADE (Grading of Recommendations Assessment, Development and Evaluation)
High certainty: further research is very unlikely to change our confidence in the estimate of effect.
Moderate certainty: further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low certainty: further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low certainty: we are very uncertain about the estimate.

[a]Randomisation, allocation, concealment and attrition bias were not always clearly described in the included trials. Assessor blindness was usually either low or not described in sufficient detail. Blinding of personnel and study participants was not met.
[b]Small number of included studies and number of participants. The optimal information size has not been reached.
[c]Only one study
[d]Heterogeneity was considerable (I^2 = 93%).
[e]Sample size was small (< 400).
[f]Heterogeneity was considerable (I^2 = 93%).
[g]Heterogeneity was considerable (I^2 = 89%).
[h]Heterogeneity was present (I^2 = 51%).
[i]Publication bias was strongly suspected.
[j]Risk of bias was very strong, for which two levels were downgraded.
[k]For this outcome, only one trial could be included, as a result of which the item imprecision was downgraded two levels.
[l]The level of certainty for this outcome measure was very strongly limited for both the risk of bias and heterogeneity. For which two levels were downgraded each time.

Summary of findings 2. Summary of findings (Dose-matched therapy in the control group)

Trunk training compared with control intervention for people after stroke

Patient or population: participants after stroke

Settings: hospital, clinic, inpatient rehabilitation centre

Intervention: all types of trunk training

Comparison: dose-matched therapy

Outcomes	Outcome measures	Anticipated absolute effect (95% CI)*	No of participants (studies)	Certainty of the evidence (GRADE)	Comments
Activities of daily living (primary outcome)	- (modified) Barthel Index - Functional Independence Measure	SMD 0.10 SD lower (0.17 lower to 0.37 higher) Analysis 2.1	229 (9 RCTs)	⊕◯◯◯ Very low[a,b,c]	
Trunk function	- Trunk Impairment Scale 1.0 & 2.0 - Modified function range - Trunk Control Test	SMD 1.03 SD higher (0.91 higher to 1.16 higher) Analysis 2.2	1217 (36 RCTs)	⊕◯◯◯ Very low[a,g,i]	
Arm-hand activity	- Rivermead Motor Assessment-Arm Scale - Manual Function Test - Wolf Motor Function Test	SMD 0.17 SD higher (-0.21 lower to 0.56 higher) Analysis 2.4	112 (3 RCTs)	⊕◯◯◯ VERY LOW[a,c,d]	
Standing balance	- Berg Balance Scale - Functional Reach Test - Tinetti Scale - Brunel Balance Assessment	SMD 1.00 SD higher (0.86 higher to 1.15 higher) Analysis 2.5	917 (22 RCTs)	⊕◯◯◯ Very low[a,e,j]	
Walking ability	- 10-Meter Timed Walk Test - Walking speed	SMD 0.69 SD higher (0.51 higher to 0.87 higher)	535 (19 RCTs)	⊕⊕◯◯ Low[a,i]	

	- Timed Up and Go Test - Tinetti Scale - 6-Meter Walk Test - Wisconsin Gait Scale	Analysis 2.7		
Quality of life after stroke	- Stroke Impact Scale 2.0 - Short Form-36 - European Quality of Life - Stroke-Specific Quality of Life scale	SMD 0.70 SD higher (0.29 higher to 1.11 higher) Analysis 2.8	111 (2 RCTs)	⊕◯◯◯ Very low[c,f,i]
Death and serious adverse events, including falls	- Number of falls - Number of serious adverse events	Relative effect (95% CI) OR 7.39 (0.15 to 372.38) Analysis 2.9	378 (10 RCTs)	⊕⊕◯◯ Low[a,k]

*The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the relative effect of the intervention (and its 95% CI).
CI: confidence interval; **OR:** odds ratio; **RCT:** randomised controlled trials; **SD:** standard deviation; **SMD:** standardised mean differences

GRADE (Grading of Recommendations Assessment, Development and Evaluation)
High certainty: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate certainty: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low certainty: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low certainty: We are very uncertain about the estimate.

[a]Randomisation, allocation, concealment and attrition bias were not always clearly described in the included trials. Assessor blindness was usually either low or not described in sufficient detail. Blinding of personnel and study participants was not met.
[b]Heterogeneity was considerable (I^2 = 84%).
[c]Sample size was small (< 400).
[d]Heterogeneity was considerable (I^2 = 88%).
[e]Heterogeneity was considerable (I^2 = 88%).
[f]Half of the risk of bias from all items were scored as unclear or high risk of bias.
[g]Heterogeneity was present (I^2 = 74%).
[i]Risk of bias was very severe for which two levels of certainty were downgraded.
[j]The level of certainty for this outcome measure was very strongly limited for both the risk of bias and heterogeneity. For which two levels were downgraded each time.
[k]Publication bias was strongly suspected.

BACKGROUND

Description of the condition

Stroke can be a devastating condition and, although progress has been made in understanding and treating it, it is still the second leading cause of death worldwide and the second most common cause of disability-adjusted life-years (GBD 2019). Stroke can affect vision, cognition, communication, and sensorimotor function. Even within this last domain, stroke can induce a wide range of deficits, from none or very minor deficits, to a complete paralysis of the affected side of the body, and even bilateral impairments.

One frequently-observed motor consequence is reduced trunk function, due to, for example, decreased co-ordination, decreased mobility or activation, decreased strength of the trunk muscles, or decreased position sense. These contribute to sitting balance deficits (Lee 2015; Verheyden 2004), particularly observed in the early stages after a stroke, but this can also occur in the later stages.

Impaired trunk components, such as decreased trunk co-ordination, muscle strength and endurance, position sense and sitting balance, have a negative impact on trunk function. Trunk function provides the ability to sit and remain upright against gravity. It also ensures moving the trunk and body freely, adopting different sitting positions, and performing seated reach without losing balance. Furthermore, adequate trunk function is a key requirement for the upper and lower part of the trunk to move separately from each other in a co-ordinated manner, for instance, whilst walking (Davies 1990; Karthikbabu 2011; Verheyden 2004). The trunk provides a stable basis for movements of the head and extremities. Additionally, the trunk can be used dynamically during, for example, transfers, reaching movements, and gait. Therefore, impaired trunk components not only affect the functioning of the trunk but also the performance of daily life activities.

Adequate trunk function is the result of different core components, including balance, muscle function, co-ordination, and position sense. A stroke can have an impact on one or more of these components.

In the early phase after stroke, researchers have observed reduced stability and a greater sway in sitting (Harley 2006). While performing a forward reach task, displacement of the centre of pressure decreased in people who had a stroke event (Messier 2004). When people who had been severely affected by stroke reached forward in an upright-seated position, the erector spinae muscles on the paretic side showed significantly higher activity than on the non-paretic side. On the other hand, the rectus abdominis muscles on the paretic side were found to be significantly less active than on the non-paretic side (Dickstein 1999). This is assumed to be related to the reduced trunk muscle strength reported previously (Bohannon 1992). Later in the rehabilitation process, trunk weakness is still detectable (Quintino 2018). Moreover, Lee and colleagues reported that the abdominal muscles were significantly thinner on the paretic side, and that the ratio between the thickness during rest and contraction of the abdominal muscles was significantly lower on the paretic side (Lee 2018). However, until now, the direct consequences of changed muscle thickness for motor movements control have not been evaluated. Stroke leads to a change in muscle morphology. Moreover, it is suggested that with the immobility after stroke, there may be a shift towards greater usage of fast muscle fibres of the trunk (Hafer-Macko 2008), and possibly a change in muscle activation pattern (Chen 2021; Wohlfarth 2014). Therefore, stroke will also have an effect on trunk muscle control and timing of muscle activation. Finally, compared to healthy, age-matched people, those who had experienced a stroke had an altered position sense of the trunk (Ryerson 2008).

Clinically, rehabilitation of trunk function is a key milestone in recovery, meaning that people after stroke should be able to sit unsupported on a bed or plinth with their trunk and head in an upright position (Smith 1999). Both trunk function and sitting balance are strongly correlated with functional independence (Di Monaco 2010; Santos 2019; Verheyden 2006), and are significant and independent predictors of motor (Smith 2017; Veerbeek 2011), and functional outcome (Hsieh 2002; Verheyden 2007). Regaining trunk function with trunk training is therefore warranted, and the importance of trunk training is recognised in the literature (Alhwoaimel 2018; Bank 2016; Cabanas-Valdés 2013; Sorinola 2014; Souza 2019; Van Criekinge 2019a). Because it is an important milestone in rehabilitation, trunk training receives most attention in the acute and early rehabilitation phase (Smith 1999). Yet, even in a later phase (i.e. more than six months after stroke), there can still be considerable impairment in trunk function (Lee 2015; Verheyden 2004) and, interestingly, studies have often focused on this later stage (Jung 2017; Karthikbabu 2018a; Sheehy 2020). Thus, trunk training may be beneficial for people in all phases after stroke.

Description of the intervention

Trunk training aims at promoting the neuromuscular control, co-ordination, strength, and endurance of trunk muscles, thereby providing a stable base for selective and co-ordinated movements of (a part of) the trunk, the head, or extremities. The specific approach can vary in the different rehabilitation phases. Trunk training can have an influence not only on trunk muscle thickness symmetry, but it can also improve the muscle activation pattern of different muscle groups (Jung 2016b). Training can improve anticipatory adjustments as reaction to internal or external perturbations (Hwang 2013; Pereira 2014), and trunk training could restore trunk dissociations while walking (Van Criekinge 2020). All these factors could have an influence on trunk function and, correspondingly, improve activities of daily living.

Early after stroke, trunk training might be undertaken in a lying or sitting position. Objectives of training are to increase trunk and body muscle activation during transfers, improve efficient muscle activation patterns, improve an upright and aligned position, and stimulate dynamic sitting balance and trunk control. The latter will result in adequate weight-shifts and the ability to reach using the upper limb within the limits of stability. Improved co-ordination results in better selective movements of the shoulder and pelvic girdle. If basic transfers, reaching, and sitting balance are achieved, therapy goals will shift towards improving muscle strength, achieving a wider range of movements in sitting, including more dynamic ability and improved dual task skills, which are required for activities of daily living.

The literature describes a diverse range of trunk training approaches (Alhwoaimel 2018; Bank 2016; Cabanas-Valdés 2013; Sorinola 2014; Souza 2019; Van Criekinge 2019a). Seven broad approaches can be distinguished: 1) core-stability training; 2) electrostimulation; 3) selective-trunk training; 4) sitting-reaching

training; 5) static inclined-surface training; 6) unstable-surface training; and 7) weight-shift training.

Core-stability training is the isometric strengthening of the trunk muscles; that is, the musculature of the pelvic and hip girdle, lumbar, abdominal, cervical, and periscapular muscles (e.g. Yoo 2010). Electrostimulation targets one or more of these core muscles (e.g. lumbar, abdominal, cervical, and periscapular muscles) with electrophysiological stimulation (e.g. Ko 2016). Selective-trunk training aims to improve co-ordinated movements in the frontal, sagittal, and horizontal planes of the upper (shoulder girdle) and lower (pelvic girdle) parts of the trunk, through voluntary trunk activation (e.g. An 2017). Training by use of sitting-reaching therapy focusing on improving sitting balance by reaching beyond arm's length with the non-affected hand, in different directions (e.g. Ada 2006). During static inclined-surface training, the person remains on a fixed, static inclined surface while performing voluntary trunk activation (e.g. Fujino 2015). Unstable-surface therapy is the therapeutic approach of training voluntary trunk activation on an unstable or moving surface that causes constant perturbations; for example, on a physio ball or a mechanical device (e.g. Karthikbabu 2011a). Finally, weight-shift training involves shifting the body weight in a single direction to the limits of sitting ability (e.g. Jung 2016a).

A summary of evidence is needed to provide both an overview of the effects of trunk training and an assessment of the individual types of trunk training.

How the intervention might work

The trunk is the core of the body. In that core, both active (muscles) and passive (tendons, fascia) tissues of the trunk provide one functional cooperating unit. Forces are generated and transferred leading to a stable and mobile base (La Scala Teixeira 2019). Therefore, the trunk has a key role in stabilising the body during movements of the head and extremities, and provides support during sitting-balance (Houglum 2012; Wee 2015). After a stroke, trunk muscle strength is reduced compared to healthy controls (Silva 2015; Tanaka 1998), leading to impaired trunk function and sitting-balance. Trunk training focusing on improving trunk and core muscle strength to improve sitting-balance, which is advantageous for enhancing basic activities of daily living.

In a cross-sectional study, a relationship between decreased trunk function and poor standing balance, mobility, and functional ability was observed (Verheyden 2006). Furthermore, initial trunk function is a predictor of functional performance (Duarte 2002; Hsieh 2002; Verheyden 2007). Trunk training could improve trunk function, but could also positively influence other components of the International Classification of Functioning, Disability and Health (ICF) framework (WHO 2001), such as mobility, balance, and functional outcome and, potentially, quality of life after stroke (Smith 2017; Veerbeek 2011).

Trunk training may increase the size and strength of trunk muscles, and this could have a positive influence on trunk muscle endurance (Van Criekinge 2019b). This may improve sitting-balance, evolving from adequate static sitting-balance to appropriate dynamic sitting-balance and refining trunk co-ordination with increased limits of stability, resulting in a positive effect on activities of daily living (such as washing and self-care).

Due to the association between trunk function and standing balance and mobility (Duarte 2002; Hsieh 2002; Isho 2016; Verheyden 2006; Verheyden 2007), an improvement in trunk function could positively impact activities such as walking up the stairs or taking a shower or bath, and thus have a positive effect on activities of daily living.

Why it is important to do this review

So far, we have identified five literature reviews investigating the effect of trunk training. An overview of the published reviews is presented in Table 1. Cabanas-Valdés and colleagues included 11 trials in their review. They did not perform a meta-analysis, but their summary indicated that trunk training had a moderate positive effect on trunk function (Cabanas-Valdés 2013). Sorinola 2014 included six trials, conducted a meta-analysis, and concluded that sitting balance and trunk training had no effect on trunk function. In contrast, Alhwoaimel 2018, which included 17 trials, performed a meta-analysis that showed a large effect of trunk training on trunk function. A recent review combined 22 trials and also noted a large effect on trunk outcome (Van Criekinge 2019a). The most recent review assessed the effect of trunk training in the first three months after stroke. The authors included nine trials and found a significant effect of trunk training on trunk outcome (Souza 2019).

All reviews investigated the effect of training on trunk function. Four reviews included outcome measures other than trunk function, such as standing balance, gait, and functional performance (Cabanas-Valdés 2013; Sorinola 2014; Souza 2019; Van Criekinge 2019a). By using different search strategies and analyses, all concluded that trunk training had a positive effect on balance, varying from a small to a huge effect. However, some reviews were based on a limited number of trials. Therefore, caution in generalising this conclusion is still necessary. The aim of one review was to examine the effect of trunk training on arm-hand performance. However, no studies could be included for the analysis (Alhwoaimel 2018). Sorinola 2014 investigated the effect of trunk training on functional performance, and included two trials with a total of 42 participants. They reported that trunk function was not effective for improving functional outcome, measured by the Functional Independence Measure.

Trunk training is a fast-growing field of research, warranting a comprehensive synthesis of the literature. In previous research, the same outcome parameters were examined, such as trunk function, standing balance, and gait. Only two reviews conducted meta-analyses to evaluate the effect of trunk training on other outcome parameters (Alhwoaimel 2018; Sorinola 2014). No other recent review used a meta-analysis to examine whether trunk training could positively improve activities of daily living.

An important common element in the previous reviews is that the data of both dose-matched and non-dose-matched comparisons were included in their analyses. Combining these different types of control therapy and therefore not making a distinction between amount of therapy in both groups, induces noise in the analyses' variation. The effect of trunk training should best be evaluated in separate analyses, based on the amount of therapy in the control group. This has not been examined so far, and could impact upon the results. This review will distinguish between dose-matched therapy (same duration of therapy in the experimental and control

intervention) and non-dose-matched therapy (different duration of therapy in the experimental and control intervention).

The majority of the reviews cited above only described the type of trunk therapy used in the included trials. In the literature, three reviews examined the effect of distinct trunk training approaches (Cabanas-Valdés 2013; Cabrera-Martos 2020; Van Criekinge 2019a). Cabanas-Valdés 2013 provided a descriptive summary of review results of both sitting balance training and trunk exercises. One review, with 14 included trials, evaluated the effect of trunk training predominantly using core stability and found that core-stability training improved outcome on the Trunk Impairment Scale (6 trials), a scale for evaluation trunk function, but not on the Berg Balance scale (5 trials), a scale for evaluating basic functional balance (Cabrera-Martos 2020). Van Criekinge 2019a studied the effect of trunk training using unstable-surface training. Unstable-surface training had a positive effect on sitting balance (3 trials) and a positive effect on gait performance (2 trials).

In conclusion, this Cochrane Review is important because it describes and synthesises the current evidence from 68 trials about the effects of trunk training after stroke on different outcomes. In contrast to other reviews, we assessed the effects of trunk training on activities of daily living, the different types of trunk training, training in the different phases after stroke, and trunk training compared to no therapy (non-dose-matched comparison) or to other therapy (dose-matched comparison) in separate analyses. Finally, we plan to keep this Cochrane Review up-to-date, assuring permanent state-of-the-art evidence synthesis in this intensively-studied research field.

OBJECTIVES

To (1) assess the effectiveness of trunk training after stroke on activities of daily living (ADL), trunk function, arm-hand function or activity, standing balance, leg function, walking ability, and quality of life for both dose-matched or non-dose-matched control groups and (2) determine the effectiveness of the most frequently used trunk training approaches.

METHODS

Criteria for considering studies for this review

Types of studies

We included only randomised controlled trials (RCTs). Cross-over randomised controlled trials were not included.

Types of participants

We included studies with adult participants (18 years or older) with either ischaemic or haemorrhagic stroke. We excluded trials including other diseases in addition to stroke, unless they reported separate results for the stroke participants of interest.

Types of interventions

We included trials that compared any type of trunk training (experimental group) versus no therapy, non-dose-matched, or dose-matched control therapy (control group). To improve the certainty that the effects evaluated in this review could be attributed to trunk training, we only included trials in which the trunk was trained specifically, as described in the types of trunk training in the Background section. If trunk training was embedded in a broader training concept, such as circuit training or a general strength programme, we did not include that study in this review.

Our primary interest was trunk training provided in a seated or lying position. The participants could be positioned on a stable or unstable surface, and could be lying in a supine, crooked, or sideways position. We expected a wide variability in types of trunk training interventions. To give a clear overview, we described the following types of trunk training:

- core-stability training;
- electrostimulation;
- selective-trunk training;
- sitting-reaching training;
- static inclined-surface training;
- unstable-surface training;
- weight-shift training; and
- other types of training.

We also included studies that aimed to improve trunk function where the intervention was performed partly in a standing position, but only when therapy was primarily conducted in a seated or lying position (about two-thirds of therapy time). Since we only investigated the effect of physical trunk training, we did not include pharmacological or surgical interventions.

Types of outcome measures

We expected that the RCTs would have used different instruments to evaluate the outcome measures of interest. We extracted data if the trials reported the outcome using the below-listed scales, or if they reported the data using a comparable rating scale. We assigned the outcome measures to the levels defined in the ICF model (WHO 2001).

We examined if the effect of trunk training was reported on:

- The level of body function, including: trunk function, leg and arm-hand function, and standing balance;
- The level of activity and participation, including: activities of daily living, arm-hand activity, walking ability, and quality of life;
- Death and serious adverse events, including falls.

The primary outcome was activities of daily living (ADL), whereas secondary outcome measurements were related to body function, activity and participation level, and adverse events. We restricted our data extraction for our primary and secondary outcome measures to the time point immediately after the intervention.

Primary outcomes

- Activities of daily living: measured by the Barthel Index (Mahoney 1965), or modified Barthel Index (Collin 1988). This scale was the priority scale for data extraction, after which we considered the Functional Independence Measure (FIM) (Keith 1987), the Reintegration to Normal Living Index (RNLI; Wood-Dauphinee 1988), and other comparable outcome parameters.

Secondary outcomes

- Trunk function: if the trial measured trunk function, sitting-balance, or both using the Trunk Impairment Scale (TIS; Verheyden 2004), we extracted these results as the priority

scale, followed by data on the Trunk Control Test (Collin 1990), and modified Functional Reach Test (Duncan 1990), or a comparable measure.

- Arm-hand function: we prioritised the Fugl-Meyer Assessment (upper extremity) (Fugl-Meyer 1975), or used data from a corresponding measure if the trial did not report this measure of choice.
- Arm-hand activity: we preferred data from the Action Research Arm Test (ARAT) (Lyle 1981), followed by the upper limb Chedoke-McMaster Stroke Assessment (Moreland 1993), or a comparable measure.
- Standing balance: we extracted data from the Berg Balance Scale as our measure of choice (Berg 1992), or the balance part of the Tinetti Scale (Tinetti 1986), or a comparable measure.
- Leg function: we favoured data from the Fugl-Meyer Assessment (lower extremity) (Fugl-Meyer 1975), or included data from a comparable measure.
- Walking ability: first, we looked at whether data were available that evaluated walking speed. Priority went to data measured with the 10-Meter Timed Walk Test (Collen 1990), followed by data from the Timed Up and Go Test (Mathias 1986), or a comparable measure. If the trial had not undertaken a gait-speed evaluation, we extracted data from other scales, such as (but not limited to) the gait part of the Tinetti Scale (Tinetti 1986), or Functional Ambulation Categories (Holden 1984).
- Quality of life: we collected data from the Stroke Impact Scale as our priority scale (Duncan 1999), or included similar quality of life outcomes.
- Death and/or serious adverse events, including falls.

We expected that the included trials might report a variety of other outcome measures. Therefore, we listed all other outcome measures of the included trials in Description of the intervention.

Search methods for identification of studies

See the methods for the Cochrane Stroke Group 'Specialised register'. We searched for trials in all languages and arranged for the translation of relevant articles where necessary.

Electronic searches

We searched the Cochrane Stroke Group trials register and the following electronic databases.

- Cochrane Central Register of Controlled Trials (CENTRAL; latest issue, last searched 25 October 2021) in the Cochrane Library (Appendix 1);
- MEDLINE Ovid (from 1946 to 25 October 2021) (Appendix 2);
- Embase Ovid (from 1974 to 25 October 2021) (Appendix 3);
- CINAHL (Cumulative Index to Nursing and Allied Health Literature) (from 1982 to 25 October 2021) (Appendix 4);
- PEDro (from 1900 to 25 October 2021) (Appendix 5);
- Scopus (from 1996 to 25 October 2021) (Appendix 6);
- SPORTDiscus EBSCO (from 1982 to 25 October 2021) (Appendix 7);
- ProQuest Dissertations and Theses (from 1997 to 25 October 2021) (Appendix 8).

We modelled the search strategies for databases on the search strategy designed for MEDLINE (Appendix 2), in consultation with the Cochrane Stroke Group's Information Specialist. We combined all search strategies deployed with subject strategy adaptations of the sensitive search strategy designed by Cochrane for identifying randomised controlled trials, as described in the *Cochrane Handbook for Systematic Reviews of Interventions* (Lefebvre 2019).

We searched the following ongoing trials registers.

- US National Institutes of Health (NIH) Ongoing Trials Register: ClinicalTrials.gov (www.clinicaltrials.gov/) (Appendix 9);
- World Health Organization (WHO) International Clinical Trials Registry Platform (ICTRP) (who.int/ictrp/en/) (Appendix 10).

Searching other resources

In an effort to identify further published, unpublished, and ongoing trials, we:

- handsearched the bibliographies of included studies and any relevant systematic reviews for further references to relevant trials;
- used Google Scholar to forward track relevant references (scholar.google.co.uk/);
- contacted original authors for clarification and additional data if trial reports were unclear;
- contacted experts/trialists/organisations in the field to obtain additional information on relevant trials where necessary;
- conducted a search of various additional supplementary sources using the Canadian Agency for Drugs and Technologies in Health (CADTH) Grey Matters checklist (www.cadth.ca/resources/finding-evidence/grey-matters) (from 1989).

Data collection and analysis

Selection of studies

Two review authors (LT and SD) independently screened titles and abstracts of the references obtained from our searching activities, and excluded obviously irrelevant reports.

We retrieved the full-text articles for the remaining references. Two review authors (LT and EV) independently screened these full-text articles, identified studies for inclusion, and identified and recorded reasons for exclusion of the ineligible studies. We resolved any disagreements through discussion or, if required, we consulted a third person (GV).

We collated multiple reports of the same study so that each study, not each reference, was the unit of interest in the review. We recorded the selection process and summarised it using a PRISMA flow diagram (Liberati 2009). We used Covidence for text screening and de-duplication of the citations (Covidence 2017).

Data extraction and management

Two review authors (LT and EV) independently extracted data from included studies using an extraction form. We obtained information about trial publication and participants, eligibility criteria, intervention(s), and results from both the experimental and control group. We used Covidence for data extraction (Covidence 2017).

We extracted data for our primary and secondary outcomes. We included trials investigating stroke and other pathologies simultaneously only if they provided outcome data separately for people with stroke.

We collected the following information about the trials' participants.

- Age (mean and standard deviation (SD));
- Number of participants;
- Sex;
- Type and location of the stroke event;
- Stroke severity at baseline, by means of the National Institutes of Health Stroke Scale (NIHSS) or comparable scale;
- Hyper-acute treatment of stroke;
- Presence of other stroke-related impairments, such as aphasia, neglect, or hemianopia;
- Comorbidity at baseline;
- Time after stroke (mean and SD) in days, weeks, or months at the start of the intervention.

We recorded the following study details: mono- vs multicentre study, geographical location, and setting.

The data analysis was done in two main analyses: one analysis (1) in which the experimental group was offered more therapy in the form of trunk training than the control group (non-dose-matched trunk training in control group); another analysis (2) in which the experimental group was offered the same amount of therapy in the form of trunk training than the control group (dose-matched trunk training in control group). The amount of therapy was determined by two independent investigators (LT and EV) who reviewed the time of therapy in minutes for each study.

To evaluate the effect of different types of trunk training on trunk function, we divided the trunk training intervention into eight categories (See Types of interventions for the definitions). Two independent investigators (LT and EV) reviewed the intervention for each study and classified it into the appropriate type of training. A third author (GV) reviewed this if there was disagreement. If an included study combined two or more types of training in the experimental intervention, the classification of type of trunk approach was then based on the major approach used in that trial. This was indicated by the two independent investigators.

We collected the following details of the interventions.

- Type of intervention;
- Length of intervention in minutes, days, or weeks;
- Total number of repetitions in the experimental and control group;
- Total minutes of intervention in the experimental and control group;
- Total minutes of conventional therapy in both groups.

We used mean time since stroke plus the intervention period to classify trials according to post-stroke phase (Bernhardt 2017).

- (Hyper) acute: from within the first 24 hours up to seven days;
- Early subacute: from seven days up to three months;
- Late subacute: more than three months up to six months;
- Chronic phase: more than six months post stroke.

The mean time post stroke plus the period of intervention had to be within one of the above-mentioned phases to be considered for analysis by phase after stroke.

To enhance transparency, we used the Template for Intervention Description and Replication (TIDieR) checklist for each included intervention to provide details of the experimental therapy (Hoffmann 2014).

We presented all outcome data in additional tables for both the intervention and control groups.

Assessment of risk of bias in included studies

Two review authors (LT and EV) independently assessed the risk of bias for each study, using the criteria outlined in the *Cochrane Handbook for Systematic Reviews of Interventions* (Lefebvre 2021).

We resolved any disagreement by discussion or by involving a third review author (GV). We assessed the risk of bias according to the Cochrane risk of bias tool for randomised trials, evaluating the following domains.

- Random sequence generation;
- Allocation concealment;
- Blinding of participants and personnel;
- Blinding of outcome assessment;
- Incomplete outcome data;
- Selective outcome reporting;
- Other bias (selection bias, performance bias, detection bias and attrition bias).

We graded the risk of bias for each domain as high, low, or unclear. We included a justification along with relevant information from the study report in the risk of bias tables.

Review authors did not evaluate the risk of bias for studies in which they participated as an author. The study conducted by review authors was evaluated by two other review authors (BE and JM), who were not involved in this study.

Measures of treatment effect

For dichotomous data, we calculated and reported odds ratios (ORs) with 95% confidence intervals (CIs). For continuous outcomes, we calculated standardised mean differences (SMDs) with 95% CIs if studies measured the same outcome using different scales, or used mean differences (MDs) and 95% CIs when all studies applied the same measurement scale. MDs provide more clinically relevant information, so we conducted a separate analysis to combine data for any outcome where more than six trials used the same measurement scale, and displayed results as MD with 95% CIs (Fu 2010). To ensure that the meta-analysis is clinically meaningful, we only combined trials when we judged participants, interventions, and outcomes to be sufficiently similar. If trials were not sufficiently similar, we included a narrative summary of the trial.

We extracted or calculated the change score (mean and SD) from the pre- and post-intervention time point for each available outcome measure. If a study provided the data as median and interquartile range, we converted the data to mean change score

and SD for large studies (with more than 100 participants in each group). For trials with smaller sample sizes (< 100 participants), we did not consider median and interquartile range data further, under the hypothesis that data are skewed and not normally distributed (Higgins 2021a; Wan 2014). In one study, none of trials were converted from median to mean values due to the small sample sizes (Liu 2020).

Unit of analysis issues

We considered two unit of analysis issues in this review:

- cluster-randomisation; and
- inclusion of trials with multiple intervention arms.

We considered the inclusion of a cluster-randomised trial; however, we planned to apply the methods of analysis recommended in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2021b).

If trials studied multiple interventions, we only included the results if the trial presented data of the different interventions that were relevant to this review separately. To avoid double counts, we did not include a study with multiple interventions in the same subgroup forest plot. If both interventions were relevant, we pooled the groups by combining the means and SDs, as recommended in Chapter 6 in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2021a). We applied the same approach when a trial compared the same type of intervention but with a different therapy amount.

Dealing with missing data

We contacted study authors to acquire missing data.

When a study presented mean change-from-baseline scores but did not report the SDs, we first contacted the authors of the RCT to request the missing data. If we did not receive a response, we calculated the SDs using the pooled correlation coefficient as described in Chapter 6 in the *Cochrane Handbook for Systematic Reviews of Interventions*(Higgins 2021a).

Assessment of heterogeneity

We calculated the I^2 statistic to measure heterogeneity among the trials for each outcome and each analysis (Higgins 2003). We considered an I^2 greater than 75% as a considerable level of heterogeneity. In such a scenario, we explored the potential sources of heterogeneity as recommended in Chapter 10 in the *Cochrane Handbook for Systematic Reviews of Interventions*(Deeks 2022).

Assessment of reporting biases

We avoided reporting bias primarily by using an extensive search strategy of multiple databases and handsearching of reference lists. Furthermore, we evaluated reporting bias for the outcome measures where we included more than 10 trials by visual inspection of funnel plots. In case doubt remained, and if more than 10 trials were included, we conducted Eggers' Regression Test for funnel plot asymmetry ($P < 0.05$) (Sterne 2005).

Data synthesis

We pooled the results of all eligible studies to present an overall estimate of the effect of trunk training on all outcome measures and according to type of training and phase after stroke, where possible. We conducted different meta-analyses for the outcome of each type of training.

In the overall estimate of the effect of trunk training, we conducted two main analyses. A first analysis included studies investigating the effect of (additional) experimental training versus no control training (non-dose-matched therapy in the control group). A second analysis investigated the effect of (additional) experimental training versus dose-matched (additional) control training.

We performed statistical analyses within Cochrane's Review Manager software, RevMan Web. We applied a fixed-effect model for continuous outcomes to avoid assigning larger studies less relative weight and smaller studies more relative weight (Borenstein 2021; Deeks 2022). For dichotomous data, analysis was conducted using a fixed-effect model. We expected only a few included studies and only rare events; for this scenario, the Peto odds ratio method is described to be less biased and more powerful than other methods (Deeks 2022).

Subgroup analysis and investigation of heterogeneity

If heterogeneity was high ($I^2 > 75\%$), we conducted a subgroup analysis for time post stroke on all outcomes and performed a meta-regression, if possible, to identify the moderators, as described below for all outcomes.

We undertook a subgroup analysis for the post-stroke phases indicated earlier (see Data extraction and management for the definition of phases post stroke). We only considered a subgroup analysis if we could include at least six studies for continuous data and four for categorical data (Fu 2010). This lower number of studies (compared to the rule of thumbs included in the Cochrane handbook) allows meta-regression to be carried out earlier, since the number of trials in the various trunk training therapy approaches and time post stroke is limited (Fu 2010).

We used the test for subgroup differences to evaluate whether the two subgroups differed significantly from each other ($P < 0.05$).

To evaluate the effect of the different trunk training approaches, we conducted two analyses: a first analysis of trials where non-dose-matched comparisons were included and a second analysis of trials where the two groups received dose-matched therapy. We interpreted the results when we could include two or more trials for that type of training, with respect to the difference in training amount between the intervention and control groups.

We assessed the influence of potential effect moderators (explanatory variables). These variables may have an influence on the effect size of the intervention. We calculated the influence of moderators using a meta-regression analysis using the "Metafor" package in R (R; Viechtbauer 2010a), performing a meta-regression for each moderator versus the relevant outcome. The potential moderators (if available) were:

- study quality;
- age of participants;
- amount of additional training;
- amount of conventional therapy;
- length of intervention;
- pre-intervention outcome level;
- phase post stroke; and

- time post stroke.

We only performed meta-regression (meta-regression of each moderator versus the relevant outcome) if we included more than 10 trials in the analysis (McKenzie 2019).

Moderators having a significant influence (P < 0.05) on the variability of the effect size were included in a mixed-effects model to evaluate whether they explained the heterogeneity of the effect size. In the mixed-effects model (meta-analytic fixed-effect and random-effects models), we included the possible moderator variable (i.e. study quality, age of participants, amount of additional therapy) as a fixed-effect in a random-effects model analysis (Viechtbauer 2010a). To examine if a trial was an outlier, we used funnel plots, influential case diagnostics, and analysed the internally and externally standardised residuals. If the externally standardised residuals of an RCT were higher than ±1.96 in absolute value (Viechtbauer 2010b), we defined that RCT as an outlier and performed an analysis with and without the outlier.

Sensitivity analysis

We performed a sensitivity analysis for risk of bias in our included studies to test the robustness of our results for our primary outcome. We excluded all trials with a high risk of bias for five domains or more: randomisation, concealed allocation, blinding of assessors and participants, blinding of outcome assessment, incomplete outcome data, selective reporting and other sources of bias. We also conducted meta-analyses with and without trials for which we imputed the calculated SDs, when six trials or more were included in the meta-analysis (Dealing with missing data; Fu 2010). We performed a third sensitivity analysis to determine whether there was a difference between using a fixed-effect model versus a random-effects model.

Summary of findings and assessment of the certainty of the evidence

We created two summary of findings tables using the following outcomes: activities of daily living, trunk function, arm-hand function, standing balance, walking ability, quality of life after stroke, and death and serious adverse events, including falls. One table summarises only the trials comparing trunk training versus non-dose-matched controls (Summary of findings 1). The other table summarises only the trials comparing trunk training versus dose-matched control therapy (Summary of findings 2). We used the five GRADE considerations (study limitations, consistency of effect, imprecision, indirectness, and publication bias) to assess the certainty of evidence as it relates to the studies that contributed data to the meta-analyses for the prespecified outcomes (Atkins 2004). We used methods and recommendations described in Chapter 14 of the *Cochrane Handbook for Systematic Reviews of Interventions* (Schünemann 2021), using GRADEpro GDT software (GRADEpro GDT). We justified all decisions to downgrade the certainty of the evidence using footnotes, and we made comments to aid the reader's understanding of the review, where necessary.

We also created additional tables with details of therapy amount in the control group; and the sensitivity analyses.

RESULTS

Description of studies

We present the details of the included and excluded studies in the Characteristics of included studies, Characteristics of excluded studies, Characteristics of studies awaiting classification, and Characteristics of ongoing studies tables.

In Table 2, Table 3, Table 4, Table 5, and Table 6, we present an overview of key study characteristics.

Results of the search

The database and manual searches conducted up to 25 October 2021 resulted in 13,189 unique records. After screening titles and abstracts, we excluded 12,237 records (Figure 1). In total, we screened 952 full texts. From those remaining records, 87 records were suitable for inclusion. After further evaluation, there are seven studies awaiting classification, nine ongoing studies, and three duplicates between the different categories (Lee 2020a; NCT03975985; Thijs 2021). A total of 68 trials met the review inclusion criteria (Included studies; Excluded studies; Ongoing studies; Studies awaiting classification). Figure 1 presents the flow chart of our review process.

Figure 1. Study flow diagram

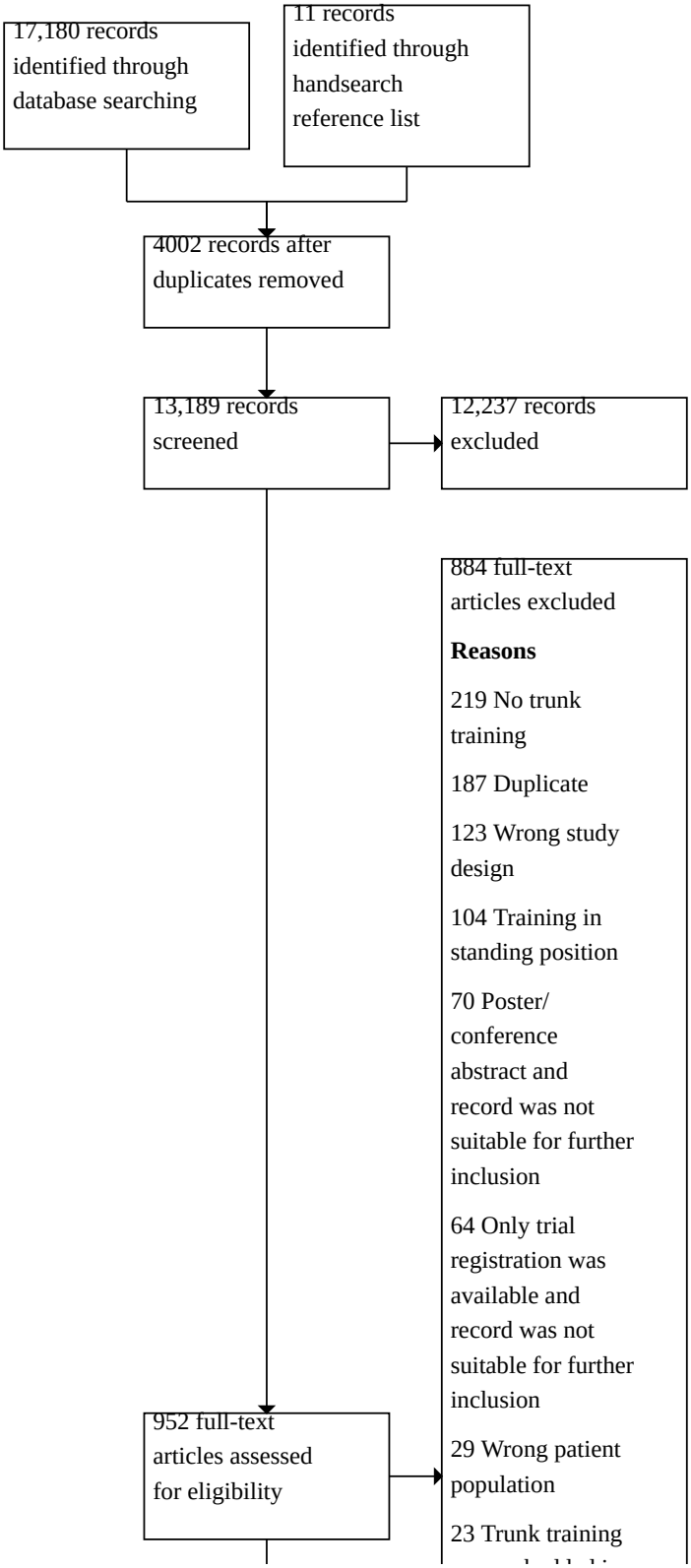
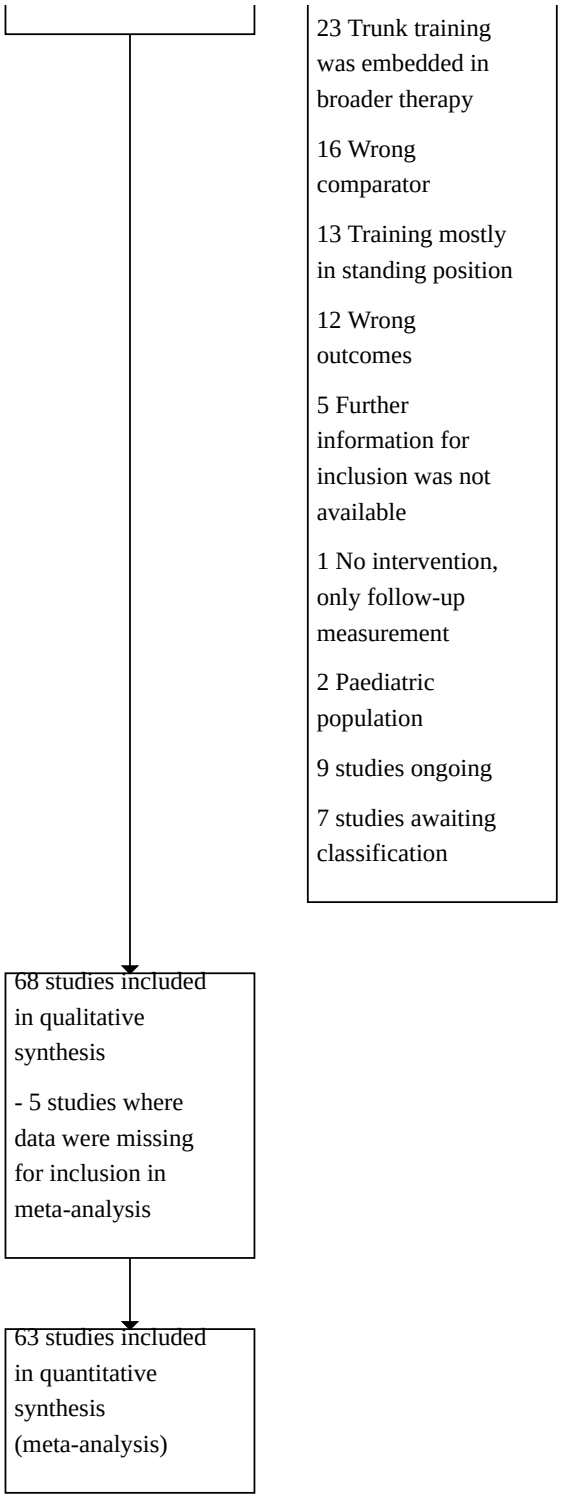


Figure 1. (Continued)



Included studies

Details of the 68 included trials and TIDieR checklists can be found in the Characteristics of included studies table. The included studies were all randomised controlled trials. Of the 68 included studies, in the Marzouk 2019 trial, no information was presented on pre-intervention data and data from change scores. Due to lack of data, this study could not be included for further analysis. The Liu 2020 study presented the outcomes of interest as median values, and the Sun 2016 study provided no standard deviations. The El-

Nashar 2019 study provided pre- and post-intervention data, but did not include standard deviations in the published manuscript. The data from the study of Rangari 2020 were not included in the further analysis due to the inconsistency and lack of clarity of the statistical method used. We contacted the authors of these five studies for further information but received no replies. Thus, we included 63 studies in the data analysis.

Mean change scores and standard deviations were presented in the published manuscripts (An 2017; Cabanas-Valdés 2016; Chan 2015; Chitra 2015; Choi 2014; Chung 2013; Chung 2014; Dean 2007; De Sèze 2001; Jung 2016b; Jung 2017; Karthikbabu 2011; Karthikbabu 2021; Kumar 2011; Lee 2012; Lee 2016a; Lee 2017a; Lee MM 2018; Lee 2020a; Merkert 2011; Park J 2017; Renald 2016; Shin 2016; Saeys 2012; Thijs 2021; Yoo 2010) or were provided by the authors for 10 trials (Bilek 2020; Büyükavcı 2016; Dean 1997; DeLuca 2020; Fujino 2016; Fukata 2019; Haruyama 2017; Kilinç 2016; Ko 2016; Shah 2016). We calculated mean change scores and standard deviations for 24 trials, whose authors did not respond to our requests for further information (Bae 2013; Cano-Mañas 2020; Chen 2020; Jung 2014; Jung 2016a; Kim 2011; Lee 2014a; Lee 2014b; Lee 2017b; Lee 2020b; Mudie 2002; Park 2013; Park 2018a; Park 2018b; Park 2020; Rangari 2020; Sarwar 2019; Seo 2012; Sharma 2017; Shim 2020; Varshney 2019; Verheyden 2009; Viswaja 2015; Yu 2013). Calculations for these trials were based on the pooled correlation coefficient. We used a coefficient of 0.83, based on the data provided by fully-reported trials. In four trials, authors provided their data as confidence intervals, which we subsequently converted to standard deviations (Dubey 2018; Karthikbabu 2018a; Sheehy 2020; Van Criekinge 2020).

Eight trials contained multiple intervention arms (Chan 2015; Jung 2016a; Karthikbabu 2018a; Karthikbabu 2021; Ko 2016; Lee 2020b; Mudie 2002; Park 2018a). Of these, six trials had two intervention arms and one control group (Chan 2015; Jung 2016a; Karthikbabu 2018a; Karthikbabu 2021; Lee 2020b; Park 2018a). We pooled data from the intervention arms in the main analysis and used separate data in the analysis of different therapy approaches. The trial of Mudie 2002 consisted of three intervention arms. We pooled data of the three intervention groups in the main analysis and only, to avoid double-counting in the control arm, used data from one trunk training approach (sitting-reaching training) for the meta-analysis of the trunk therapy approaches. In the main meta-analysis, we used data from the sitting-reaching therapy approach and the control group. We did not pool data from the Ko 2016 study because the authors compared core trunk training, electrical stimulation, and the combination of core training and electrical stimulation. We included data from Ko 2016 for the core-stability trunk training in the training approach analysis, and data from the combined intervention versus electrical stimulation in the main meta-analysis, following the majority of therapy approaches included in this analysis.

Sample size and study location

The 68 included trials had 2585 participants in total, with 1366 participants in the experimental group and 1219 in the control group. Authors of six trials did not mention study location (Bae 2013; Chan 2015; Chung 2013; Kim 2011; Park 2018a; Renald 2016). Four trials were conducted in an outpatient clinic (DeLuca 2020; El-Nashar 2019; Marzouk 2019; Thijs 2021). One trial was conducted in the home setting (Dean 1997). Twenty-six trials were conducted in a hospital setting (An 2017; Bilek 2020; Cano-Mañas 2020; Chen 2020; Chitra 2015; Chung 2014; Fukata 2019; Haruyama 2017; Jung 2016a; Karthikbabu 2011; Karthikbabu 2018a; Ko 2016; Lee 2012; Lee 2014a; Lee 2016a; Lee 2017b; Lee MM 2018; Lee 2020a; Lee 2014b; Liu 2020; Park 2013; Park 2020; Sarwar 2019; Seo 2012; Viswaja 2015; Yu 2013), 26 trials were conducted in a rehabilitation facility (Büyükavcı 2016; Choi 2014; Dean 2007; De Sèze 2001; Dubey 2018; Fujino 2016; Jung 2014; Jung 2016b; Jung 2017; Karthikbabu 2021; Kilinç 2016; Kumar 2011; Park J 2017; Park 2020; Rangari 2020; Saeys 2012; Shah 2016; Sharma 2017; Sheehy 2020; Shim 2020; Shin 2016; Sun 2016; Van Criekinge 2020; Verheyden 2009; Varshney 2019; Yoo 2010), and one trial took place in a geriatric rehabilitation centre (Merkert 2011). Four trials were multicentre trials (Cabanas-Valdés 2016; Karthikbabu 2011; Lee 2017a; Lee 2020a).

Fifty-one of the included trials were conducted in Asia, 11 in Europe, three in Australia, two in Africa, and one in North America.

The median sample size was 15 in the experimental group (interquartile range: 12 to 23) and 15 in the control group (interquartile range: 10 to 20.5). The group size varied from five people per intervention arm (Lee 2016a), to 90 people per intervention arm (Chen 2020).

Sample characteristics

The mean age in the experimental group was 59.68 years (standard deviation: 6.27) with a minimum age of 44.37 years (Chung 2013), and a maximum age of 74.92 years (Cabanas-Valdés 2016). The average age of the control group was 60.39 years (6.11) with a minimum age of 48.38 years (Chung 2013), and a maximum age of 75.69 years (Cabanas-Valdés 2016) (seeTable 2).

For 16 trials, the study intervention occurred in the early subacute phase, defined as the period from one week to three months after the stroke event (Büyükavcı 2016; Cabanas-Valdés 2016; Chen 2020; Dean 2007; De Sèze 2001; Fujino 2016; Fukata 2019; Karthikbabu 2011; Ko 2016; Kumar 2011; Lee 2017b; Park 2018a; Shah 2016; Van Criekinge 2020; Verheyden 2009; Yoo 2010). The interventions of eight trials took place in the late subacute phase, between three and six months after stroke (Cano-Mañas 2020; Chitra 2015; Haruyama 2017; Lee 2016a; Lee MM 2018; Lee 2020a; Merkert 2011; Saeys 2012). Most of the interventions in the trials (29 in total) happened more than six months after the stroke event (An 2017; Bae 2013; Chan 2015; Choi 2014; Chung 2013; Chung 2014; Dean 1997; DeLuca 2020; Dubey 2018; El-Nashar 2019; Jung 2014; Jung 2016a; Jung 2017; Karthikbabu 2018a; Karthikbabu 2021; Kilinç 2016; Kim 2011; Lee 2012; Lee 2014a; Lee 2017a; Lee 2020b; Park 2020; Seo 2012; Sharma 2017; Sheehy 2020; Shim 2020; Shin 2016; Thijs 2021; Yu 2013). Fifteen trials did not provide details about the timing of their post-stroke interventions (Bilek 2020; Jung 2016a; Lee 2014a; Liu 2020; Marzouk 2019; Mudie 2002; Park 2013; Park J 2017; Park 2018b; Rangari 2020; Renald 2016; Sarwar 2019; Sun 2016; Varshney 2019; Viswaja 2015) (Table 2).

Intervention approaches

The included trials used a variety of trunk training approaches (Table 5).

In 18 trials, core-stability training, defined as isometric strengthening of the trunk muscles, was identified as the intervention approach (Cabanas-Valdés 2016; Chen 2020; Chitra 2015; Chung 2013; Chung 2014; El-Nashar 2019; Haruyama 2017; Jung 2016a; Karthikbabu 2021; Kim 2011; Kilinç 2016; Ko 2016; Lee

2017a; Lee 2014b; Lee 2020b; Sharma 2017; Yoo 2010; Yu 2013). In total, 757 people participated, with 376 in the experimental groups and 381 in the control groups.

Across seven trials, 106 participants received electrical stimulation that targeted one or more of the core trunk muscles, with 105 participants in the control groups, for a total of 211 participants (Bilek 2020; Chan 2015; Jung 2016a; Ko 2016; Park 2018a; Park 2018b; Shim 2020).

In 15 trials, researchers provided selective-trunk training aimed at improving selective movements of the upper and lower part of the trunk (An 2017; Chan 2015; Dubey 2018; Karthikbabu 2018a; Kumar 2011; Lee 2020a; Mudie 2002; Park 2018a; Park 2020; Saeys 2012; Seo 2012; Shin 2016; Thijs 2021; Van Criekinge 2020; Verheyden 2009). The total study sample was 443, with 229 participants in the selective-trunk training groups and 214 participants in the control groups.

In six trials, training was provided by use of sitting-reaching therapy in different directions (Büyükavcı 2016; Dean 1997; Dean 2007; De Sèze 2001; Mudie 2002; Sheehy 2020). In total, 184 participants were included, with 94 in the experimental and 90 in the control groups.

In two trials, participants trained on a 10° steady-tilted platform in comparison with a horizontal platform (Fujino 2016; Fukata 2019). The total group size was 58, with 29 participants in each group.

Participants of the experimental training in 17 trials completed exercises on an unstable surface (Bae 2013; Choi 2014; DeLuca 2020; Jung 2016b; Karthikbabu 2011; Karthikbabu 2018a; Karthikbabu 2021; Lee 2012; Lee 2014a; Lee 2017a; Merkert 2011; Park 2013; Rangari 2020; Renald 2016; Sarwar 2019; Varshney 2019; Viswaja 2015). These studies included a total of 637 participants, with 319 participants in the experimental groups and 318 in the control groups.

Four trials, with 97 participants in total, involved weight-shift training. Participants had to shift their body weight in a single direction to the limits of stability (Jung 2014; Jung 2016a; Lee 2016a; Lee MM 2018). In the experimental groups, 57 participants received weight-shift training, compared to 54 participants in the control groups.

We could not classify three trials as one of the seven predefined trunk training approaches; thus, we categorised these trials as applying 'other' intervention approaches. In total, they comprised 96 participants, with 46 in the experimental groups and 50 participants in the control groups. In the Cano-Mañas 2020 trial, participants in the experimental group received video-based trunk training. Trunk training was provided as a sitting-boxing programme for the experimental group in the Park J 2017 study. Trunk exercises in combination with motor imagery was the therapy approach in the Shah 2016 trial.

Duration of therapy

The included studies provided a median of four weeks of experimental training, with a median of 600 minutes of total training in the experimental groups and 360 minutes of total training in the control groups. The intensity of training in minutes ranged from a minimum of 30 minutes of training in Lee 2017b to a maximum of 2700 minutes (45 hours) of training in Merkert 2011. The longest duration of therapy programme in weeks was offered by Kilinç 2016, where participants trained for a period of 12 weeks (Table 3).

Comparison interventions

We divided the included studies into two groups, based on the amount of therapy given in the control arms. In the first group of trials, participants in the control arm did not receive the same amount of therapy (non-dose-matched therapy). In this review, we found 20 trials with a total of 365 participants in the experimental groups and 345 participants in the control arms where no additional therapy or non-dose-matched therapy was provided (An 2017; Bilek 2020; Büyükavcı 2016; Cabanas-Valdés 2016; Cano-Mañas 2020; Chung 2013; Kumar 2011; Lee 2012; Lee 2014b; Lee 2016a; Lee MM 2018; Lee 2020b; Merkert 2011; Mudie 2002; Seo 2012; Shin 2016; Thijs 2021; Varshney 2019; Verheyden 2009; Yu 2013). In the control arm of Marzouk 2019, participants received no training; however, we did not include that study in our analysis due to missing data.

In the second group of 44 trials, control-group participants received the same amount of therapy (i.e. 'dose-matched therapy') as participants in the experimental group (Bae 2013; Chan 2015; Chitra 2015; Choi 2014; Chen 2020; Chung 2014; Dean 1997; Dean 2007; DeLuca 2020; De Sèze 2001; Dubey 2018; Fujino 2016; Fukata 2019; Haruyama 2017; Jung 2014; Jung 2016a; Jung 2016b; Jung 2017; Karthikbabu 2011; Karthikbabu 2018a; Karthikbabu 2021; Kim 2011; Kilinç 2016; Ko 2016; Lee 2014a; Lee 2017a; Lee 2017b; Lee 2020a; Park 2013; Park J 2017; Park 2018a; Park 2018b; Park 2020; Rangari 2020; Renald 2016; Saeys 2012; Sarwar 2019; Shah 2016; Sharma 2017; Sheehy 2020; Shim 2020; Van Criekinge 2020; Viswaja 2015; Yoo 2010). There was a total of 931 participants in the experimental group and 814 participants in the control group. Participants in the control arms of the El-Nashar 2019, Liu 2020, and Sun 2016 trials received the same amount of therapy as intervention-group participants; however, due to missing data, we did not include their data in the analysis.

Therapy offered as a control intervention was diverse. In three trials, the training consisted of cognitive exercises (Dean 1997; Dean 2007; Van Criekinge 2020). Thirteen trials provided additional conventional therapy (DeLuca 2020; De Sèze 2001; Dubey 2018; Haruyama 2017; Jung 2014; Karthikbabu 2018a; Karthikbabu 2021; Kim 2011; Lee 2017a; Liu 2020; Shah 2016; Sun 2016; Yoo 2010). In 11 trials, participants in the control arms received the same exercises but on a stable surface (Bae 2013; Chen 2020; Chung 2014; Jung 2016b; Karthikbabu 2011; Lee 2014a; Rangari 2020; Renald 2016; Sarwar 2019), or horizontal surface (Fujino 2016; Fukata 2019). Seven trials provided the same training in the control group without the training approach of interest; for example, without electrical stimulation (Jung 2016a; Park 2018a; Park 2018b; Shim 2020), without biofeedback (Jung 2017; Park 2013), or without core training (Sharma 2017). Three trials provided active or passive upper limb training (Lee 2017b; Lee 2020a; Saeys 2012). Finally, in a number of studies, control-arm participants received diverse training approaches such as reaching training (Sheehy 2020; Viswaja 2015), movements out of a diagonal pattern (Park 2020), strengthening training (Chitra 2015; El-Nashar 2019; Kilinç 2016), and task-oriented training (Choi 2014). In one trial, participants in the control group received no additional training, only health education about measuring their blood pressure and monitoring the incidence of falls (Chan 2015). See Characteristics of included studies and Table 5 for further details.

Outcomes

Primary outcome

Activities of daily living

In this review, we identified 15 trials, with a total of 554 participants, in which the effect of trunk training on activities of daily living was provided. From that group of 15 trials, one trial reported this outcome using the modified Barthel Index (Sharma 2017), and 10 using the Barthel index (Cabanas-Valdés 2016; Cano-Mañas 2020; Dubey 2018; Ko 2016; Lee 2017a; Merkert 2011; Mudie 2002; Park 2018a; Rangari 2020; Shah 2016). The remaining four trials evaluated change in activities of daily living using the Functional Independence Measure (Büyükavcı 2016; Chitra 2015; De Sèze 2001; Fukata 2019).

Secondary outcomes

Trunk function

Of the 63 trials, 51 (1755 participants) reported outcome on trunk function. Of that group, 37 trials reported trunk function by means of the Trunk Impairment Scale 1.0 (An 2017; Büyükavcı 2016; Chan 2015; DeLuca 2020; Fukata 2019; Haruyama 2017; Jung 2014; Jung 2016a; Jung 2016b; Karthikbabu 2011; Karthikbabu 2021; Kilinç 2016; Ko 2016; Kumar 2011; Lee 2012; Lee 2016a; Lee 2017a; Lee 2017b; Lee 2020a; Park 2018a; Park 2018b; Park 2020; Rangari 2020; Renald 2016; Saeys 2012; Sarwar 2019; Shah 2016; Sharma 2017; Shim 2020; Shin 2016; Thijs 2021; Van Criekinge 2020; Varshney 2019; Verheyden 2009; Viswaja 2015; Yoo 2010; Yu 2013), and four using the Trunk Impairment Scale 2.0 (Bae 2013; Cabanas-Valdés 2016; Dubey 2018; Karthikbabu 2018a). Five of the included trials tested trunk function via the Trunk Control Test (De Sèze 2001; Fujino 2016; Fukata 2019; Shah 2016; Yoo 2010), seven by means of the modified Functional Reach Test (Choi 2014; Dean 1997; Dean 2007; Jung 2017; Lee 2012; Lee MM 2018; Shin 2016), and one with the Postural Assessment Scale for Stroke (Bilek 2020).

Arm-hand function

Three trials (93 participants) evaluated the effect of trunk training on arm-hand function (Büyükavcı 2016; Kilinç 2016; Lee 2016a): by means of the Fugl-Meyer Assessment (Lee 2016a), the Brunnstrom Recovery Stages (Büyükavcı 2016), and the Stroke Rehabilitation Assessment of Movement-upper extremity (Kilinç 2016).

Arm-hand activity

Four trials (142 participants) assessed the effect of trunk training on arm-hand activity (Lee MM 2018; Park J 2017; Saeys 2012; Sheehy 2020). One trial evaluated arm-hand activity using the Rivermead Motor Assessment-Arm Scale (Saeys 2012), two by means of the Manual Function Test (Lee MM 2018; Park J 2017), and one by the Wolf Motor Function Test (Sheehy 2020).

Standing balance

The effect of trunk training on standing balance was studied in 33 trials (1330 participants). In 22 trials, the Berg Balance Scale was used to assess standing balance (An 2017; Büyükavcı 2016; Cabanas-Valdés 2016; Chen 2020; Chitra 2015; DeLuca 2020; Karthikbabu 2021; Kilinç 2016; Ko 2016; Lee 2014a; Lee 2016a; Lee 2017a; Lee 2014b; Merkert 2011; Park 2013; Park J 2017; Park 2018a; Park 2020; Saeys 2012; Sarwar 2019; Shim 2020; Yoo 2010). Five studies applied the Functional Reach Test in standing (Cano-Mañas 2020; Choi 2014; Haruyama 2017; Kim 2011; Seo 2012). In three trials, the Tinetti Scale-balance was used (Cano-Mañas 2020; Karthikbabu 2018a; Van Criekinge 2020), and three trials utilised the Brunel Balance Assessment to evaluate standing balance (Karthikbabu 2011; Kumar 2011; Shah 2016).

Leg function

Three trials used the Fugl-Meyer Assessment (lower extremity) to assess leg function (Chen 2020; Dubey 2018; Lee 2020a). The Büyükavcı 2016 trial used the Brunnstrom Recovery Stages, and Kilinç 2016 used the Stroke Rehabilitation Assessment of Movement-lower extremity.

Walking ability

Thirty trials (with 901 participants in total) evaluated walking ability. Of these, six trials used as their measurement scale the 10-Meter Timed Walk Test (Dean 2007; Jung 2016b; Kilinç 2016; Lee 2020b; Park 2020; Thijs 2021). Five trials evaluated walking ability by reported walking speed (Chung 2013; Dubey 2018; Lee 2014b; Park 2020; Van Criekinge 2020). Ten trials in total used the Timed Up and Go Test to investigate the effect of trunk training on walking ability (Cano-Mañas 2020; Chung 2013; Haruyama 2017; Jung 2014; Kilinç 2016; Lee 2014a; Lee 2016a; Lee 2014b; Merkert 2011; Shin 2016). In six trials, researchers used the Tinetti Scale-gait to evaluate walking ability (Cabanas-Valdés 2016; Cano-Mañas 2020; Merkert 2011; Park 2018b; Saeys 2012; Van Criekinge 2020). Two trials investigated change in walking ability using the 6-Meter Walk Test (Lee 2020a; Park 2018b). One trial tested walking ability by the Dynamic Gait Index (Shim 2020), and one by the Wisconsin Gait Scale (Sharma 2017).

For 15 trials, the outcomes were indicated as negative values, where lower scores represented better performances. We used the absolute values in the analysis (An 2017; Cano-Mañas 2020; Chung 2014; Haruyama 2017; Jung 2014; Jung 2016b; Kilinç 2016; Lee 2014a; Lee 2016a; Lee 2020a; Lee 2020b; Lee 2014b; Park J 2017; Park 2020; Sharma 2017).

Quality of life

Only four trials measured quality of life (Bilek 2020; Cano-Mañas 2020; Karthikbabu 2018a; Park J 2017). They used the Stroke Impact Scale 2.0 (Karthikbabu 2018a), the Short Form-36 (Bilek 2020), the European Quality of Life scale (Cano-Mañas 2020), and the Stroke-Specific Quality of Life scale (Park J 2017), respectively.

Death and serious adverse events, including falls

The occurrence of adverse events was under-reported. A minority of trials mentioned data about adverse events. Fifty-three trials did not evaluate (or if evaluated, did not report) adverse events (An 2017; Bae 2013; Bilek 2020; Büyükavcı 2016; Cabanas-Valdés 2016; Chan 2015; Chen 2020; Chitra 2015; Choi 2014; Chung 2013; Chung 2014; Dean 1997; DeLuca 2020; Dubey 2018; Fujino 2016; Jung 2014; Jung 2016a; Jung 2016b; Jung 2017; Karthikbabu 2011; Karthikbabu 2021; Kilinç 2016; Kim 2011; Ko 2016; Kumar 2011; Lee 2012; Lee 2014a; Lee 2017b; Lee 2020a; Lee 2020b; Lee 2014b; Marzouk 2019; Merkert 2011; Mudie 2002; Park 2013; Park J 2017; Park 2018b; Park 2020; Rangari 2020; Renald 2016; Saeys 2012; Sarwar 2019; Seo 2012; Shah 2016; Sharma 2017; Shim 2020; Sun 2016; Van Criekinge 2020; Varshney 2019; Verheyden 2009; Viswaja 2015; Yoo 2010; Yu 2013).

The other 15 trials did evaluate and report occurrence of adverse events. Nine of these trials indicated that no adverse events occurred during the study (Cano-Mañas 2020; De Sèze 2001; Fukata 2019; Haruyama 2017; Karthikbabu 2018a; Lee 2016a; Lee 2020b; Liu 2020; Park 2018a). Dean 2007 reported that one participant slipped from the chair while training. In Thijs 2021, one participant fell during the study, and three different participants indicated muscle soreness after therapy (shoulder, hip, and back regions); fatigue (general, and of the leg and trunk) was found acceptable in this trial. Shoulder pain occurred in two trials (Lee MM 2018; Sheehy 2020). Dizziness, lower limb soreness, fatigue, and itching sensation was described in one trial (Lee 2017a). Adverse events, fatigue, and pain were reported but interpreted as negligible in Shin 2016.

Excluded studies

We excluded a total of 884 trials (Figure 1). Of these, we excluded 191 trials after discussion amongst the review authors who carried out study screening. We listed the most important reasons for exclusion of these trials in the Characteristics of excluded studies table. The most important reasons for exclusions were: no trunk therapy was provided; ineligible study design; and training only in standing position.

Risk of bias in included studies

See Characteristics of included studies, Figure 2, and Figure 3 for the summaries of the risk of bias analysis. We omitted trials with a high risk of bias in further Sensitivity analysis. We followed the Cochrane handbook for guidance to evaluate the risk of bias (Lefebvre 2021).

Figure 2. Risk of bias summary: review authors' judgements about each risk of bias item for each included study.

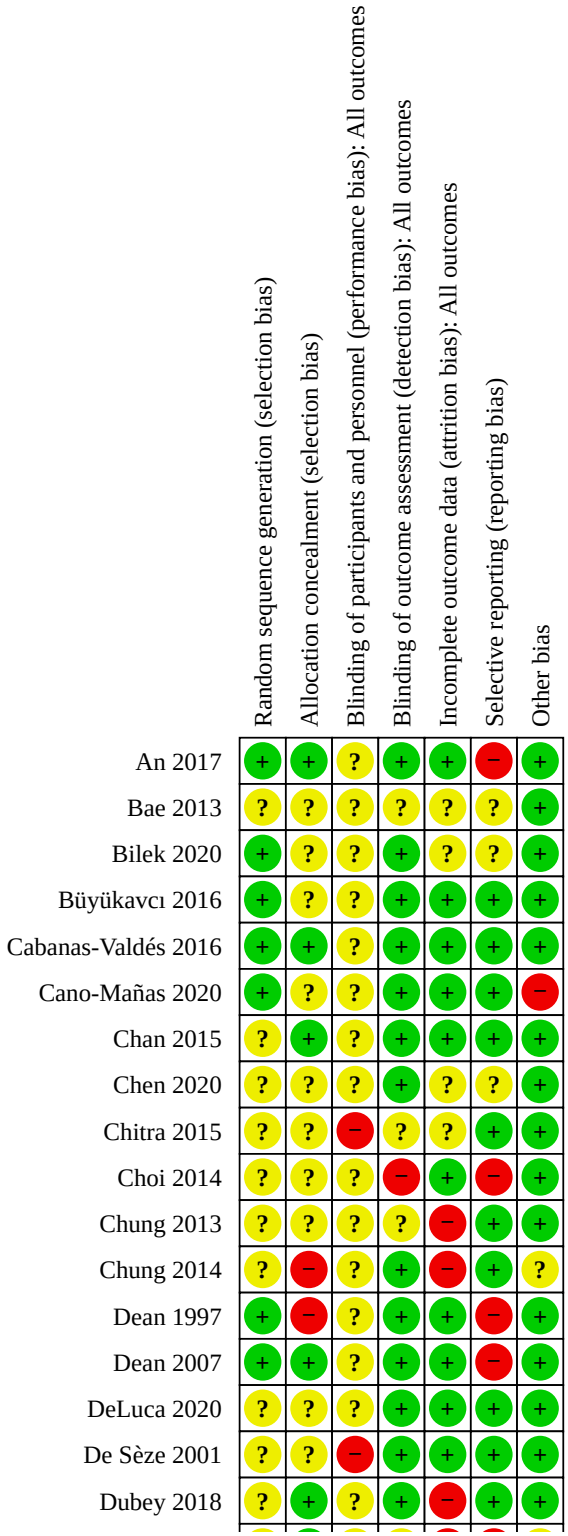


Figure 2. (Continued)

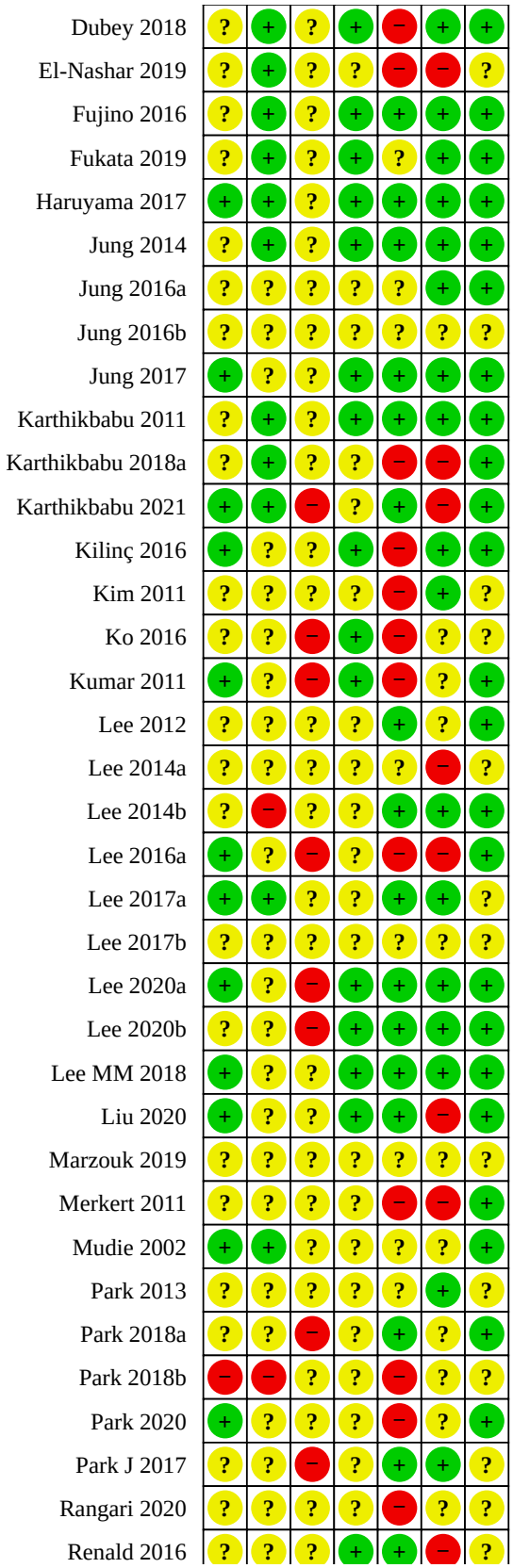


Figure 2. (Continued)

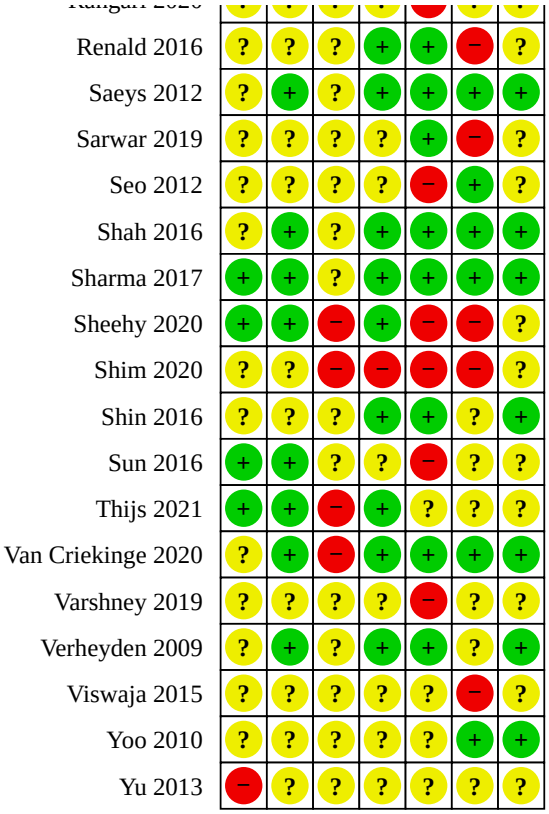
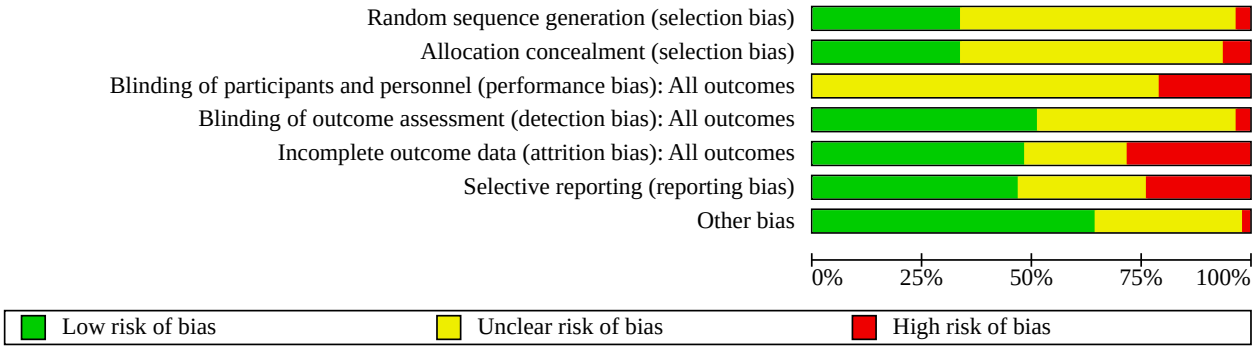


Figure 3. Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies



Allocation

A total of 23 trials reported an adequate randomisation sequence generation (An 2017; Bilek 2020; Büyükavcı 2016; Cano-Mañas 2020; Cabanas-Valdés 2016; Dean 1997; Dean 2007; Haruyama 2017; Jung 2017; Kilinç 2016; Kumar 2011; Karthikbabu 2021; Lee 2016a; Lee 2017a; Lee MM 2018; Lee 2020a; Liu 2020; Mudie 2002;Park 2020; Sharma 2017; Sheehy 2020;Sun 2016; Thijs 2021), 43 trials were unclear (Bae 2013, Chan 2015; Chitra 2015; DeLuca 2020; De Sèze 2001; Fujino 2016; Fukata 2019; Lee 2017b; Marzouk 2019; Chen 2020; Choi 2014; Chung 2013; Chung 2014; Dubey 2018; El-Nashar 2019; Jung 2014; Jung 2016a; Jung 2016b; Karthikbabu 2011; Karthikbabu 2018a; Kim 2011; Ko 2016; Lee 2012; Lee 2014a; Lee 2014b; Lee 2020b; Merkert 2011;Park 2013; Park 2018a; Park J 2017; Rangari 2020; Renald 2016; Saeys 2012; Sarwar 2019; Seo 2012; Shim 2020; Shah 2016; Shin 2016; Varshney 2019; Van Criekinge 2020; Verheyden 2009; Viswaja 2015; Yoo 2010), and two trials did not state if a random process was executed (Park 2018b; Yu 2013). The most common method for performing random allocation was by computer (Bilek 2020; Büyükavcı 2016; Cano-Mañas 2020; Haruyama 2017; Jung 2017; Kilinç 2016; Lee 2016a; Lee 2017a; Lee MM 2018; Lee 2020a; Park 2020; Sharma 2017; Shin 2016; Sun 2016). Randomisation was executed by an independent

researcher who was not involved in the assessment or treatment of the patients in four trials (Thijs 2021; Van Criekinge 2020; Verheyden 2009; Viswaja 2015). Ten trials used block randomisation (An 2017; Dean 1997; Dean 2007; Dubey 2018; Fujino 2016; Fukata 2019; Karthikbabu 2011; Karthikbabu 2018a; Karthikbabu 2021; Kumar 2011); only three of these reported details on the block size or number of blocks (An 2017; Karthikbabu 2021; Kumar 2011). The An 2017 trial had a block size of 2 x 2. Karthikbabu 2021 used 16 blocks; each block contained six randomly ordered intervention assignments (two each for stable support, unstable support core-stability regimens, and control group, respectively). Kumar 2011 used five blocks with four participants in each block to ensure equal numbers of participants in both groups. Dean 2007 used sealed opaque envelopes containing the allocation, which was generated earlier by a person independent of the study using random number tables. Randomisation in the study of Dean 1997 involved random sampling without replacement; participants drew a card from a box that was originally filled with 10 control and 10 experimental cards.

Six studies did not report any detail on the size of the blocks; we scored these as 'unclear' (Dubey 2018; Fujino 2016; Fukata 2019; Karthikbabu 2011; Karthikbabu 2018a; Shah 2016).

Other methods used in the included trials involved: placing cards in a box with the allocation group mentioned on the cards (Bae 2013; Park 2018a; Park 2020); placing pieces of paper numbered '1' or '2' in a box (Lee 2014b); placing pieces of paper inscribed with 'control' or 'experimental' in a box (Dean 1997); or an independent person randomly distributing envelopes (Jung 2014; Saeys 2012). In one study, 40 numbers from a random numbers table were alternately written on slips of paper and sequentially drawn from a box by a clinician independent of the study (Mudie 2002).

One trial used a randomisation web site (www.randomization.com) to randomly distribute the participants to groups (Park 2020). The Sheehy 2020 study also randomised their participants with a web-generated method based at a remote co-ordinating centre. The randomisation was performed within permuted blocks in a 1:1 ratio. The Cabanas-Valdés 2016 and Haruyama 2017 trials used a random, computer-generated list specific to each centre. More specifically, in Cabanas-Valdés 2016, an external person uninvolved in the treatment or follow-up of participants generated the list. The Haruyama 2017 study attempted to prevent intervention effects being influenced by differences in trunk function at baseline by adopting a permuted-block method combined with stratified randomisation using the total Trunk Impairment Scale score. The block size was two. The investigators stratified the Total Trunk Impairment Scale score into scores of 14 or higher, or less than 14 (out of a possible total of 23), based on the median score reported for stroke patients. In the trial of Sun 2016, participants were randomly divided into either an experimental or control group by a random computer-generated sequence.

The Liu 2020 trial randomised participants by assigning each a code that was matched to a random number generated from a random numbers table in a spreadsheet. In Shim 2020, the random (rand) function was used after participants were coded and entered into an Excel file.

In 43 studies, the method of sequence generation was often not described at all or briefly described with no details given (Bae 2013, Chan 2015; Chitra 2015; DeLuca 2020; De Sèze 2001; Fujino 2016; Fukata 2019; Lee 2017b; Marzouk 2019;Chen 2020; Choi 2014; Chung 2013; Chung 2014; Dubey 2018; El-Nashar 2019; Jung 2014; Jung 2016a; Jung 2016b; Karthikbabu 2011; Karthikbabu 2018a; Kim 2011; Ko 2016; Lee 2012; Lee 2014a; Lee 2014b; Lee 2020b; Merkert 2011;Park 2013; Park 2018a; Park J 2017; Rangari 2020; Renald 2016; Saeys 2012; Sarwar 2019; Seo 2012; Shim 2020; Shah 2016; Shin 2016; Varshney 2019; Van Criekinge 2020; Verheyden 2009; Viswaja 2015; Yoo 2010). Hence, sequence generation cannot be performed in the exact same way in a future study. We assessed these trials as having an unclear risk of bias in this domain. No details were reported on the lottery method (Chitra 2015), the randomisation table (De Sèze 2001), or randomisation conducted through a random draw (Park J 2017).

We scored the studies as high risk for selection bias when the methodology of dividing into groups was not completely at random. Thus, two studies showed a high risk for selection bias (Park 2018b; Yu 2013).

We scored the studies as unclear risk for selection bias (allocation concealment) when nothing was reported on the randomisation sequence or the study reported only that the participants were randomly distributed into different groups. We assessed most of the trials (41/68) as having an unclear risk of bias for allocation concealment (Bae 2013; Bilek 2020; Büyükavcı 2016; Cano-Mañas 2020; Chitra 2015; Choi 2014; Chung 2013; DeLuca 2020;Jung 2016b; Kim 2011; Kilinç 2016; Ko 2016; Lee 2014a; Lee 2017b; Lee 2020b; Liu 2020; Marzouk 2019; Park 2013; Park J 2017; Rangari 2020; Sarwar 2019; Shim 2020; Shin 2016; Varshney 2019; Viswaja 2015; Yoo 2010; Yu 2013; Chen 2020; De Sèze 2001; Jung 2016a; Kumar 2011; Lee 2012; Lee 2016a; Lee 2020a; Lee MM 2018; Merkert 2011; Park 2018a; Park 2020; Renald 2016; Seo 2012; Jung 2017).

Allocation concealment was clearly described for 23 trials (An 2017; Cabanas-Valdés 2016; Chan 2015; Dean 2007; Dubey 2018; El-Nashar 2019; Fujino 2016; Fukata 2019; Haruyama 2017; Jung 2014; Karthikbabu 2011; Karthikbabu 2018a; Karthikbabu 2021; Lee 2017a; Mudie 2002; Saeys 2012; Shah 2016; Sharma 2017; Sheehy 2020; Sun 2016; Thijs 2021; Van Criekinge 2020; Verheyden 2009). In nine trials, a third party - not involved in the intervention - completed concealment (An 2017; Chan 2015; Fukata 2019; Haruyama 2017; Karthikbabu 2011; Shah 2016; Sharma 2017; Verheyden 2009; Thijs 2021). Five trials did not report if sealed envelopes were opaque (An 2017; Jung 2014; Jung 2016a; Saeys 2012; Van Criekinge 2020). Eleven trials specified that concealment of allocation took place using opaque envelopes (Cabanas-Valdés 2016; Dean 2007; Dubey 2018; Fujino 2016; Fukata 2019; Karthikbabu 2011; Karthikbabu 2018a; Karthikbabu 2021; Lee 2017a; Sun 2016; Sharma 2017).

Three trials described the concealment allocation procedure in more detail. In Lee 2014b, each participant chose a piece of paper with number 1 or 2 written on it from a box containing 22 pieces of paper. In Mudie 2002, slips of paper containing the random numbers were placed in an opaque canister. At first contact, an independent person drew a number from the container. In Sheehy 2020, an email with the allocation was sent to the study trainer.

Four trials were scored as having high risk of bias on allocation concealment (Chung 2014; Dean 1997; Lee 2014b; Park 2018b.)

Blinding

Overall, none of the included studies applied and reported blinding for both the participants and the personnel.

We assessed trials as having a high risk of bias when it was clear that neither the participants nor the personnel were blinded. Fourteen trials had a high risk of performance bias (Chitra 2015; De Sèze 2001; Karthikbabu 2021; Ko 2016; Kumar 2011; Lee 2016a; Lee 2020a; Lee 2020b; Park 2018a; Park J 2017; Sheehy 2020; Shim 2020; Thijs 2021; Van Criekinge 2020). In four studies, all participants were aware of the treatment allocation in the study design (Ko 2016; Park J 2017; Park 2018a; Sheehy 2020). In one study, it was stated that the therapists were not blinded (Shim 2020). In one study, therapists had a consensus meeting with the study participants to clear out all doubts and discrepancies (Karthikbabu 2021). Participants were briefed about the nature of the study (Chitra 2015). The outcome assessor was only blinded in the study of De Sèze 2001. It was described in the study of Van Criekinge 2020 that the authors tried to plan to blind both patients and therapists in addition to the assessor; however, it was unlikely that they would stay blind, due to the nature of the intervention(s) applied. Lee 2020a and Lee 2020b reported that only the assessor was blinded, not the participants or study personnel.

In 54 trials, it was unclear how the blinding of participants or personnel was administered (An 2017; Bae 2013; Bilek 2020; Büyükavcı 2016; Cabanas-Valdés 2016; Cano-Mañas 2020; Chan 2015; Chen 2020; Choi 2014; Chung 2013; Chung 2014; Dean 1997; Dean 2007; DeLuca 2020; Dubey 2018; El-Nashar 2019; Fujino 2016; Fukata 2019; Haruyama 2017; Jung 2014; Jung 2016a; Jung 2016b; Jung 2017; Karthikbabu 2011; Karthikbabu 2018a; Kilinç 2016; Kim 2011; Lee 2012; Lee 2014a; Lee 2017a; Lee 2017b; Lee 2014b;Lee MM 2018; Liu 2020; Marzouk 2019; Merkert 2011; Mudie 2002; Park 2013; Park 2018b; Park 2020; Rangari 2020; Renald 2016; Saeys 2012; Sarwar 2019; Seo 2012; Shah 2016; Sharma 2017; Shin 2016; Sun 2016; Varshney 2019; Verheyden 2009; Viswaja 2015; Yoo 2010; Yu 2013). In one trial, the therapists were blinded (Saeys 2012); in two trials, the participants were blinded (Bilek 2020; Shim 2020); and in two trials, the participants received sham training, however no details were provided on personal blinding (Dean 1997; Dean 2007). Investigators for the Van Criekinge 2020 study stated that they tried to blind participants, therapists, and assessors. Another trial reported that the study had a double-blinded design (Büyükavcı 2016), but investigators did not report how the blinding of the participants or personnel was done. Therefore, we assessed this trial as having an unclear risk of performance bias. Some trials reported that the participants were informed about the nature of the study but did not provide further information (Chitra 2015; Choi 2014; Lee MM 2018).

Two trials indicated that detection bias was likely (Choi 2014; Shim 2020). Thirty-five trials declared that the outcome assessor was blinded to prevent detection bias (An 2017; Bilek 2020; Büyükavcı 2016; Cabanas-Valdés 2016; Cano-Mañas 2020; Chan 2015; Chen 2020; Chung 2014; Dean 1997; Dean 2007; DeLuca 2020; De Sèze 2001; Dubey 2018; Fujino 2016; Fukata 2019; Haruyama 2017; Jung 2014; Jung 2017; Karthikbabu 2011; Kilinç 2016; Ko 2016; Kumar 2011; Lee 2020a; Lee 2020b; Lee MM 2018; Liu 2020; Renald 2016; Saeys 2012; Shah 2016; Sharma 2017; Sheehy 2020; Shin 2016; Thijs 2021; Van Criekinge 2020; Verheyden 2009). Some trials stated that the investigator was not aware of the treatment allocation (Cabanas-Valdés 2016; Cano-Mañas 2020; Chen 2020; Dean 2007; DeLuca 2020; De Sèze 2001; Dubey 2018; Fujino 2016; Karthikbabu 2011; Ko 2016; Kumar 2011; Renald 2016; Saeys 2012), or did not participate in provision of the intervention (Cabanas-Valdés 2016; Chen 2020; Dean 2007; DeLuca 2020; Dubey 2018; Saeys 2012; Shah 2016). In one trial, participants were registered in the database by means of a patient ID code, so assessors were blinded during analysis (Van Criekinge 2020). Of the trials with a low risk of detection bias, 18 trials only reported that the assessor was blinded, without further details (An 2017; Bilek 2020; Büyükavcı 2016; Chan 2015; Chung 2014; Dean 1997; Fukata 2019; Haruyama 2017; Jung 2014; Jung 2017; Kilinç 2016; Lee MM 2018; Lee 2020a; Lee 2020b; Liu 2020; Sheehy 2020; Shin 2016; Verheyden 2009). These abovementioned trials were scored as 'low risk'.

A total of 29 studies did not report any aspect of blinding the assessor and were therefore scored 'unclear' (Bae 2013; Chitra 2015; Chung 2013; El-Nashar 2019; Jung 2016a; Jung 2016b; Karthikbabu 2018a; Karthikbabu 2021; Kim 2011; Lee 2014a; Lee 2014b; Lee 2016a; Lee 2017b; Marzouk 2019; Merkert 2011; Mudie 2002; Park 2013; Park J 2017; Park 2018a; Park 2018b; Park 2020; Rangari 2020; Sarwar 2019; Seo 2012; Sun 2016; Varshney 2019; Viswaja 2015; Yoo 2010; Yu 2013). Two trials reported that the assessor did not participate in the intervention but did not mention the term blinding and were therefore also scored as having 'unclear risk' (Lee 2012; Lee 2017a).

Incomplete outcome data

In total, we assessed 19 trials as having a high risk of attrition bias for the following reasons: higher dropout ratio in the intervention group compared to the control group (Sheehy 2020); not all reasons that participants were lost to follow-up were mentioned (Dubey 2018; Kilinç 2016; Ko 2016; Park 2020; Seo 2012; Sun 2016; Varshney 2019), or these reasons were only vaguely described (Chung 2014; El-Nashar 2019); it was unclear to which group the 'lost to follow-up' participants belonged (Kumar 2011; Merkert 2011); and not all participants were analysed post-intervention and no additional information about this was provided (Shim 2020). In one trial, there was no flow chart and it was not reported whether all participants completed the entire study (Chung 2013). In five trials, there was a high dropout percentage, more than 16% per group stopped the intervention (Karthikbabu 2018a; Lee 2016a) or study authors did not report if there were any dropouts or the possible reasons (Kim 2011; Park 2018b; Rangari 2020).

We judged 16 trials as having an unclear risk of attrition bias (Bae 2013; Bilek 2020; Chen 2020; Chitra 2015; Fukata 2019; Jung 2016a; Jung 2016b; Lee 2014a; Lee 2017b; Marzouk 2019; Mudie 2002; Park 2013; Thijs 2021; Viswaja 2015; Yoo 2010; Yu 2013). One trial did not provide details about the baseline characteristics (Viswaja 2015). In one trial, the dropout rate was rather high: 20% in the intervention group and 10% in the control group (Renald 2016). However, the reasons for dropouts were well described, and thus we scored this study as having a low risk of attrition bias.

We assessed the remaining 33 trials as having a low risk of attrition bias (An 2017; Büyükavcı 2016; Cabanas-Valdés 2016; Cano-Mañas 2020; Chan 2015; Choi 2014; Dean 1997; Dean 2007; DeLuca 2020; De Sèze 2001; Fujino 2016; Haruyama 2017; Jung 2014; Jung 2017; Karthikbabu 2011; Karthikbabu 2021; Lee 2012; Lee 2017a; Lee MM 2018; Lee 2020a; Lee 2020b; Lee 2014b; Liu 2020; Park J 2017; Park 2018a; Saeys 2012; Sarwar 2019; Shah 2016; Sharma 2017; Sheehy 2020; Shin 2016; Van Criekinge 2020; Verheyden 2009). These trials

presented a flow chart, described the reasons for dropouts or had dropouts that had nothing to do with the nature of the intervention. Notably, in Sharma 2017, there was a considerably higher dropout rate in the control group (13%) than in the experimental group (9%).

Selective reporting

Most of the trials showed no reporting bias (32/68) (Büyükavcı 2016; Cabanas-Valdés 2016; Cano-Mañas 2020; Chan 2015; Chitra 2015; Chung 2013; Chung 2014; DeLuca 2020; De Sèze 2001; Dubey 2018; Fujino 2016; Fukata 2019; Haruyama 2017; Jung 2014; Jung 2016a; Jung 2017; Karthikbabu 2011; Kilinç 2016; Kim 2011; Lee MM 2018; Lee 2020a; ; Lee 2014b; Lee 2014b; Lee 2017a; Park 2013; Park J 2017; Saeys 2012; Seo 2012; Shah 2016; Sharma 2017; Van Criekinge 2020; Yoo 2010). Thirteen trials did not have a trial registration but reported both significant and non-significant results, with P values; we therefore scored these as 'low risk' (Jung 2014; Jung 2016a; Jung 2017; Karthikbabu 2011; Kilinç 2016; Kim 2011; Lee 2017a; Lee MM 2018; Lee 2020b; Lee 2014b; Park 2013; Park J 2017; Yoo 2010).

We assessed 20 trials as having an unclear risk of reporting bias, due to the lack of trial registration, unreported P values, and only significant results in favour of the experimental group (Bae 2013; Bilek 2020; Chen 2020; Jung 2016b; Ko 2016; Kumar 2011; Lee 2012; Lee 2017b; Marzouk 2019; Mudie 2002; Park 2018a; Park 2018b; Park 2020; Rangari 2020; Shin 2016; Sun 2016; Thijs 2021; Varshney 2019; Yu 2013). We rated one further study as having an unclear risk of bias in this domain: Verheyden 2009 did not report the Tinetti Scale post-intervention, but showed significant and non-significant results.

Sixteen trials had a high risk for reporting bias (An 2017, Choi 2014; Dean 1997; Dean 2007; El-Nashar 2019; Karthikbabu 2018a; Karthikbabu 2021; Lee 2016a; Lee 2014a; Shim 2020; Viswaja 2015; Merkert 2011;Renald 2016;Sarwar 2019; Sheehy 2020;Liu 2020). Five out of the eleven trials did not report the results of outcome measures included in the trial registration (Karthikbabu 2018a; Karthikbabu 2021; Liu 2020; Sharma 2017). The Dean 1997 study did not report post-intervention results on two outcome measures (i.e. walking speed and activities of daily living), and the Viswaja 2015 study did not report baseline characteristics. Dean 2007 did not report P values and exclusively reported significant outcome measures in favour of the intervention group. No study registration was available for El-Nashar 2019, and it did not report standard deviations.

Other potential sources of bias

Most of the trials (44/68) had a low risk for other potential sources of bias (An 2017; Bae 2013; Bilek 2020; Büyükavcı 2016; Cabanas-Valdés 2016; Chan 2015; Chen 2020; Chitra 2015; Choi 2014; Chung 2013; Dean 1997; Dean 2007; DeLuca 2020; De Sèze 2001; Dubey 2018; Fujino 2016; Fukata 2019; Haruyama 2017; Jung 2014; Jung 2016a; Jung 2017; Karthikbabu 2011; Karthikbabu 2018a; Karthikbabu 2021; Kilinç 2016; Kumar 2011; Lee 2012; Lee 2016a; Lee MM 2018; Lee 2020a; Lee 2020b; Lee 2014b; Liu 2020; Merkert 2011; Mudie 2002; Park 2018a; Park 2020; Saeys 2012; Shah 2016; Sharma 2017; Shin 2016; Van Criekinge 2020; Verheyden 2009; Yoo 2010). Of the 68 included trials, 23 had an unclear risk (Chung 2014; El-Nashar 2019; Jung 2016b; Kim 2011; Ko 2016; Lee 2014a; Lee 2017a; Lee 2017b; Marzouk 2019; Park 2013; Park J 2017; Park 2018b; Rangari 2020; Renald 2016; Sarwar 2019; Seo 2012; Sheehy 2020; Shim 2020; Sun 2016; Thijs 2021; Varshney 2019; Viswaja 2015; Yu 2013). We assessed one trial as being at high risk due to between-group baseline differences for the affected body side and Montreal Cognitive Assessment (MoCA) test (Cano-Mañas 2020).

Effects of interventions

See: **Summary of findings 1** Summary of findings (Non-dose-matched therapy in the control group); **Summary of findings 2** Summary of findings (Dose-matched therapy in the control group)

In order to determine the overall effectiveness of trunk training as well as the effectiveness when considering dose-matched or non-dose-matched comparisons, we conducted different analyses. We evaluated the following comparisons of outcomes.

- Outcome 1: effect of trunk training on activities of daily living;
- Outcome 2: effect of trunk training on trunk function;
- Outcome 3: effect of trunk training on arm-hand function;
- Outcome 4: effect of trunk training on arm-hand activity;
- Outcome 5: effect of trunk training on standing balance;
- Outcome 6: effect of trunk training on leg function;
- Outcome 7: effect of trunk training on walking ability;
- Outcome 8: effect of trunk training on quality of life.

We performed a general analysis, an analysis with the different trunk training approaches, and an analysis within the different phases post stroke. The results for the general analysis can be found in forest plots in the Data and analyses section for the non-dose-matched therapy comparisons in Analysis 1.1; Analysis 1.2; Analysis 1.3; Analysis 1.4; Analysis 1.5; Analysis 1.6; Analysis 1.7; Analysis 1.8; Analysis 1.9; Analysis 1.10; Analysis 1.11; Analysis 1.12; Analysis 1.13; Analysis 1.14; Analysis 1.15; Analysis 1.16 and for the dose-matched therapy comparisons in Analysis 2.1; Analysis 2.2; Analysis 2.3; Analysis 2.4; Analysis 2.5; Analysis 2.6; Analysis 2.7; Analysis 2.8; Analysis 2.9; Analysis 2.10; Analysis 2.11; Analysis 2.12; Analysis 2.13; Analysis 2.14; Analysis 2.15; Analysis 2.16; the results for the analysis with the different trunk training approaches can be found in Table 7 and the results for the different phases post stroke can be found in Table 8. For each outcome analysis, we have presented three sensitivity analyses (Table 9): a sensitivity analysis using a random-effects model; a sensitivity analysis excluding trials with a high risk of bias; and a sensitivity analysis excluding trials for which we calculated mean change score using the pooled correlation coefficient, as described in Dealing with missing data, Sensitivity analysis and Included studies sections.

We calculated data using an inverse-variance, fixed-effect model, where a higher SMD or MD reflects effects in favour of trunk training, unless explicitly noted.

Primary outcome: effect of trunk training on activities of daily living

In five trials, participants received non-dose-matched therapy in the control group, favouring trunk training (SMD 0.96, 95% CI 0.69 to 1.24, P < 0.001, I^2 = 94%, 283 participants, very low-quality evidence, Analysis 1.1, Summary of findings 1). In nine trials, participants in the control group received the same therapy amount as in the experimental group. Analysis for dose-matched therapy did not favours trunk training (SMD 0.10, 95% CI -0.17 to 0.37, P < 0.048, I^2 = 62%, 229 participants, very low-quality evidence, Analysis 2.1, Summary of findings 2).

Analysis for trials measuring activities of daily living with the Barthel Index for non-dose-matched therapy resulted in an MD of 11.58, 95% CI 6.80 to 16.35 (P < 0.001, I^2 = 0%, 4 trials, 209 participants, very low-quality evidence, Analysis 1.10) favouring trunk training. Analysis for dose-matched therapy also did not favour trunk training (MD 2.21, 95% CI -0.82 to 5.25, P < 0.001, I^2 = 81%, 6 trials, 151 participants, very low-quality evidence, Analysis 2.10).

Egger's test and funnel plot suggest potential publication bias (Figure 4, Figure 5).

Figure 4. Figure 4: Funnel plot (1.1 Activities of daily living, experimental training vs control group, non-dose-matched therapy in control group)

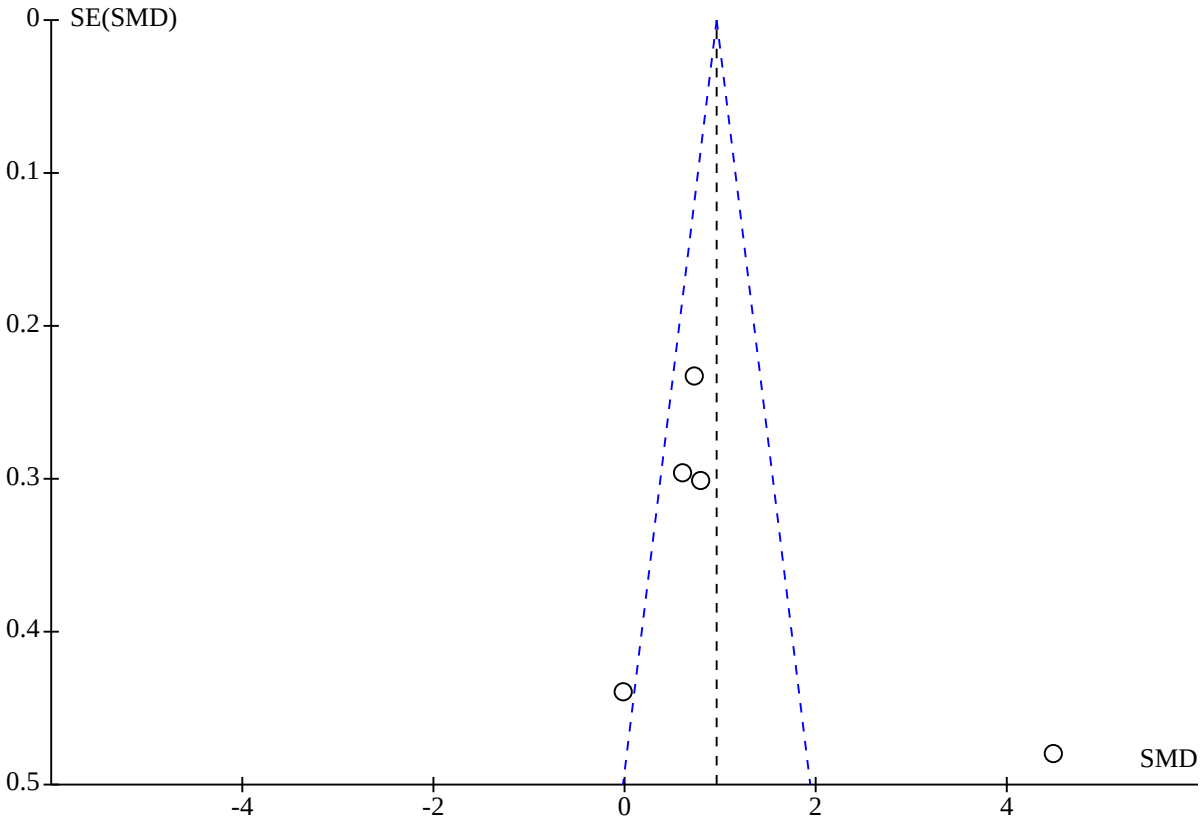
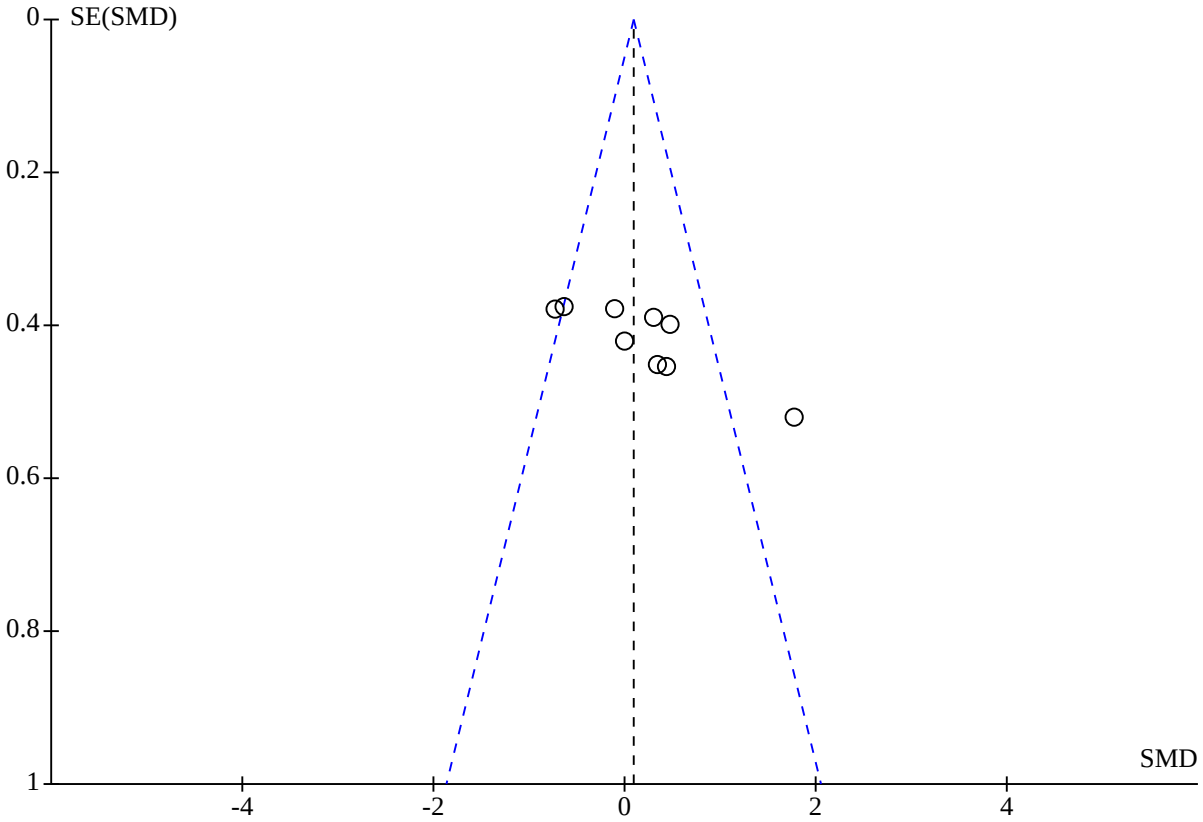


Figure 5. Figure 5: Funnel plot (2.1 Activities of daily living, experimental training vs control group, dose-matched therapy in control group)



Effect of trunk training on activities of daily living: sensitivity analyses

Sensitivity analysis random-effects model

Pooling data of five trials with 255 participants using the random-effects model also resulted in a positive effect in favour of trunk training (SMD 1.39, 95% CI 0.28 to 2.51, P = 0.01, I^2 = 93%, very low-quality evidence, random-effects model, Table 9). There remained no evidence of an effect using the random-effects model for the non-dose-matched analysis (SMD 0.16, 95% CI -0.28 to 0.60, P = 0.48, I^2 = 62%, 9 trials, 229 participants, very low-quality evidence, random-effects model, Table 9).

Activities of daily living measured with the Barthel Index (4 trials, 191 participants) also resulted in an effect in favour of trunk training for the (MD 11.02, 95% CI 6.55 to 15.49, P < 0.001, low-quality evidence, I^2 = 0%, Table 9) and no evidence of an effect for the dose-matched analysis (MD 5.89, 95% CI -1.73 to 13.51, P = 0.13, low-quality evidence, I^2 = 81%, 6 trials, 151 participants, Table 9).

Sensitivity analysis risk of bias

In total, five trials scored high or unclear on five domains of risk of bias score on all outcomes of ADL.

After exclusion, pooling data of the non-dose-matched analysis still resulted in a positive effect in favour of trunk training (SMD 1.19, 95% CI 0.81 to 1.56, P < 0.001, I^2 = 97%, 3 trials, 177 participants, very low-quality evidence, Table 9). Sensitivity analysis of activities of daily living measured with the Barthel Index also resulted a positive effect in favour of trunk training (MD 13.11, 95% CI 5.25 to 20.97, P = 0.001, I^2 = 0%, 2 trials, 113 participants, very low-quality evidence, Table 9).

Excluding trials with a high risk of bias from the dose-matched analysis did not changed the overall effect. There was no evidence of effect on activities of daily living (MD 0.19, 95% CI -0.15 to 0.52, P = 0.27, I^2 = 68%, 6 trials, 149 participants, very low-quality evidence, Table 9) and on activities of daily living measured with the Barthel Index after exclusion of trials with high risk of bias (MD -1.55, 95% CI -3.96 to 0.85, P = 0.21, I^2 = 91%, 4 trials, 101 participants, very low-quality evidence, Table 9).

Sensitivity analysis excluding calculated mean change scores trials

When conducting a sensitivity analysis in which we excluded trials where the change score has been calculated for this review, the overall effect remained positive in favour of trunk training for the non-dose-matched analysis (SMD 0.78, 95% CI 0.49 to 1.08, P < 0.001, I^2 = 0%, 3 trials, 191 participants, very low-quality evidence, Table 9); and also for the non-dose-matched trials where activities of daily living were measured with the Barthel Index the effect, after deleting trials with the calculated mean change score, remained positive in favour of trunk training (SMD 13.15, 95% CI 6.57 to 19.73, P < 0.001, I^2 = 0%, 2 trials, 127 participants, very low-quality evidence, Table 9).

Excluding the trials where the change scores were calculated did not change the overall effect in the dose-matched analysis (SMD 0.08, 95% CI -0.23 to 0.38, P = 0.63, I^2 = 0%, 7 trials, 176 participants, very low-quality evidence, Table 9) or for the dose-matched analysis where activities of daily living measured with the Barthel Index revealed no evidence of an effect (MD -1.67, 95% CI -4.34 to 1.00, 4 trials, 98 participants, I^2 = 91%, low-quality evidence, Table 9).

Effect of the different trunk therapy approaches on activities of daily living

Non-dose-matched therapy in both groups

Only one trial was available for trunk training approaches core-stability training, unstable-surface training and other types of trunk training (Table 7) and two trials for sitting-reaching training (SMD 2.69, 95% CI 2.00 to 3.39, 80 participants, Table 7).

No data were available for electrostimulation, selective-trunk training, static inclined-surface training and weight-shift training (Table 7).

Dose-matched therapy in both groups

Training using the selective-trunk training approach did not result in an effect in favour of selective-trunk training on activities of daily living (SMD 0.39, 95% CI -0.16 to 0.93, P = 0.02, I^2 = 0%, 2 trials, 56 participants). However, there was evidence of an effect in favour of selective-trunk training on activities of daily living when measured with the Barthel Index (MD 7.12, 95% CI 1.01 to 13.22, P = 0.77, I^2 = 0%, 2 trials, 56 participants). Core-stability training had no effect on activities of daily living (SMD -0.19, 95% CI -0.66 to 0.28, P = 0.42, I^2 = 45%, 3 trials, 73 participants, Table 7).

Unstable-surface trunk training, electrostimulation, static inclined-surface training, sitting-reaching training, and other approaches of trunk training were only evaluated in one trial (Table 7).

No data were available for evaluating the effect of weight-shift training (Table 7).

Effect of trunk training on activities of daily living: time post-stroke analysis

For two trials, no specific data were presented on time post stroke.

Non-dose-matched therapy in both groups

In both the early (143 participants) and late subacute phases (96 participants), participants received additional trunk therapy in only two trials. Because the number of trials is lower than six trials, the results are not discussed in this section (Table 8).

Dose-matched therapy in both groups

Six trials with 150 participants were conducted in the early subacute phase, one trial with 30 participants in the late subacute phase and two trials with 49 participants in the chronic phase. Across comparisons, there was a non-significant subgroup difference (P = 0.07) (Table 8).

Of the nine included trials, six trials used the Barthel Index. Four trials with 102 participants were undertaken in the early subacute phase and two trials with 49 participants in the chronic phase. The effect of trunk training on activities of daily living was different between the phases (early subacute and chronic) after stroke (P = 0.05, Table 8).

Effect of trunk training on activities of daily living: meta-regression

There were no potential effect modifiers for study quality; age of participants; amount of additional training in both arms; amount of conventional therapy in both arms; length of intervention; pre-intervention outcome level; different phases post stroke and time post stroke without intervention period (Table 10).

Secondary outcome - effect of trunk training on trunk function

In 14 trials, participants received non-dose-matched therapy, with an overall effect of SMD 1.46, 95% CI 1.26 to 1.71 (P < 0.001, I^2 = 89%, 466 participants, very low-quality evidence, Analysis 1.2, Summary of findings 1). In the remaining 36 trials with 1217 participants, participants in the control group received dose-matched therapy with an overall SMD 1.03, 95% CI 0.91 to 1.16 (P < 0.001, I^2 = 74%, very low-quality evidence, Analysis 2.2, Summary of findings 2).

Ten trials measured trunk function using the Trunk Impairment Scale resulting in an effect in favour of the experimental group (MD 2.88, 95% CI 2.72 to 3.04, P < 0.001, I^2 = 95%, 280 participants, very low-quality evidence, Analysis 1.11) for non-dose-matched therapy. In the trials where both groups received dose-matched therapy, evidence was found in favour of trunk training (MD 1.87, 95% CI 1.66 to 2.08, P < 0.001, I^2 = 85%, 26 trials, 833 participants, very low-quality evidence, Analysis 2.11).

Non-dose-matched therapy favours trunk training, measured using the modified Functional Reach test, with an effect of MD 2.17, 95% CI 1.03 to 3.30 (P < 0.001, I^2 = 91%, 3 trials, 82 participants, very low-quality evidence, Analysis 1.12); dose-matched training in both group favours trunk training with a lower effect of MD 0.13, 95% CI 0.10 to 0.16 (P < 0.001, I^2 = 91%, 4 trials, 112 participants, very low-quality evidence, Analysis 2.12).

Egger's test and funnel plot suggest potential publication bias (Figure 6, Figure 7, Table 6).

Figure 6. Figure 6: Funnel plot (1.2 Trunk function, experimental training vs control group, non-dose-matched therapy in control group)

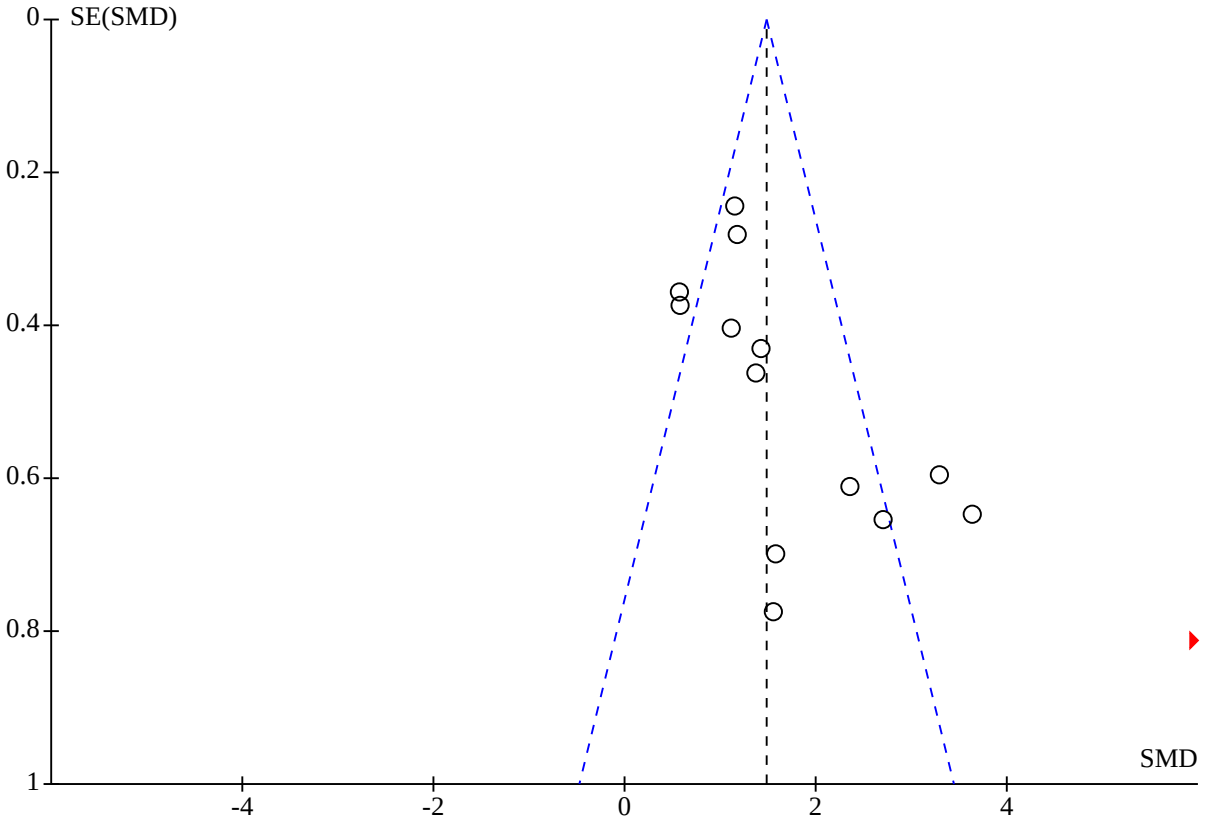
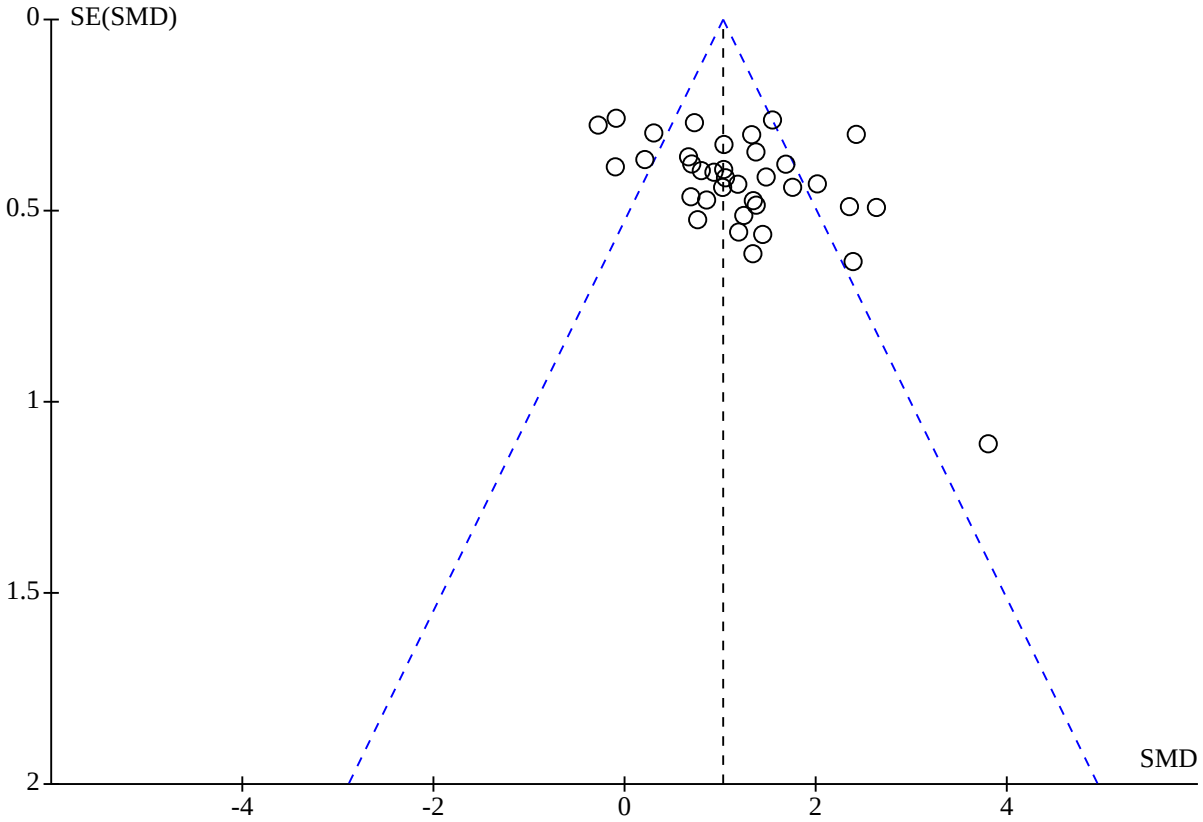


Figure 7. Figure 7: Funnel plot (2.2 Trunk function, experimental training vs control group, dose-matched therapy in control group)



Effect of trunk training on trunk function: sensitivity analyses

Sensitivity analysis random-effects model

Performing the original analysis with a random-effects model resulted, as in the main analysis, for the non-dose-matched analysis, in an overall positive effect of SMD 2.08, 95% CI 1.38 to 2.79 ($P < 0.001$, $I^2 = 89\%$, 14 trials, 466 participants, very low-quality evidence, Table 9) and also for the dose-matched analysis in an overall positive effect SMD 1.15, 95% CI 0.89 to 1.40 ($P < 0.001$, $I^2 = 74\%$, 36 trials, 1217 participants, very low-quality evidence, Table 9).

The random-effects model did not alter the effect of trunk function in favour of trunk training measured with the Trunk Impairment Scale 1.0 nor for the non-dose-matched analysis (MD 2.94, 95% CI 1.96 to 3.92, $P < 0.001$, 10 trials, 280 participants, $I^2 = 95\%$, very low-quality evidence, Table 9) nor for the dose-matched analysis (MD 2.33, 95% CI 1.73 to 2.94, $P < 0.001$, 26 trials, 883 participants, $I^2 = 85\%$, very low-quality evidence, Table 9).

Evaluating the effect of the random-effects model on the modified Functional Reach Test again did not change the positive effect of trunk training in the non-dose-matched analysis (MD 5.99, 95% CI 0.21 to 11.77, $P = 0.04$, $I^2 = 91\%$, 3 trials, 82 participants, very low-quality evidence, Table 9) or in the dose-matched analysis (MD 0.17, 95% CI -0.00 to 0.33, $P = 0.05$, $I^2 = 91\%$, 4 trials, 112 participants, very low-quality evidence, Table 9).

Sensitivity analysis risk of bias

After excluding five trials due to a high risk of bias, the effect of trunk training stayed positive in favour of trunk training in the non-dose-matched analysis (SMD 1.37, 95% CI 1.13 to 1.62, $P < 0.001$, $I^2 = 92\%$, 9 trials, 368 participants, very low-quality evidence, Table 9) and positive in the dose-matched analysis (SMD 1.19, 95% CI 1.01 to 1.37, $P < 0.001$, $I^2 = 80\%$, 21 trials, 650 participants, very low-quality evidence, with exclusion of 15 trials, Table 9).

The effect remained in favour of trunk training for the non-dose-matched analysis measured using the Trunk Impairment Scale 1.0 MD 3.59, 95% CI 3.39 to 3.78 ($P < 0.001$, $I^2 = 88\%$, 6 trials, 194 participants, very low-quality evidence, 1 trial excluded due to high risk of bias, Table 9) and positive for the dose-matched analysis (SMD 2.49, 95% CI 2.13 to 2.85, $P < 0.001$, $I^2 = 81\%$, 13 trials, 352 participants, very low-quality evidence, 13 trials excluded due to high risk of bias, Table 9).

Excluding trials with a high risk of bias in the non-dose-matched analysis did not alter the evidence of an effect when measuring trunk function using the modified Functional Reach Test (MD 1.77, 95% CI 0.61 to 2.93, $P < 0.001$, $I^2 = 90\%$, 2 trials, 54 participants, very low-quality evidence, Table 9) nor for non-dose-matched analysis (MD 0.13, 95% CI 0.10 to 0.16, $P < 0.001$, $I^2 = 99\%$, 3 trials, 74 participants, very low-quality evidence, Table 9)

Sensitivity analysis excluding calculated mean change scores trials

When including trials where data for analysis was provided, an effect could still be seen in favour of trunk training in the non-dose-matched analysis (SMD 1.32, 95% CI 1.07 to 1.57, I^2 = 61%, 9 trials, 313 participants, very low-quality evidence, Table 9) and in the dose-matched analysis (SMD 1.13, 95% CI 0.98 to 1.29, I^2 = 77%, 35 trials, 846 participants, very low-quality evidence, Table 9).

The sensitivity analysis of the Trunk Impairment Scale 1.0 did not alter the effect for the non-dose-matched analysis (effect in favour of trunk training, MD 2.90, 95% CI 2.44 to 3.35, I^2 = 85%, 7 trials, 204 participants, very low-quality evidence, Table 9) nor for the dose-matched analysis (effect in favour of trunk training, MD 2.90, 95% CI 2.59 to 3.24, I^2 = 78%, 16 trials, 516 participants, very low-quality evidence, Table 9).

Trunk function measured using the modified Functional Reach did not change the direction of the effect for the non-dose-matched analysis (MD 2.17, 95% CI 1.03 to 3.03, P < 0.001, I^2 = 85%, 3 trials, 82 participants, very low-quality evidence, Table 9) nor for the dose-matched analysis (MD 0.13, 95% CI 0.10 to 0.16, P < 0.001, I^2 = 88%, 3 trials, 74 participants, very low-quality evidence, Table 9).

Effect of the different trunk therapy approaches on trunk function

Non-dose-matched therapy in both groups

There was evidence of a positive effect on trunk function using core-stability training (SMD 1.32, 95% CI 0.87 to 1.76, P < 0.001, I^2 = 70%, 2 trials, 99 participants, Table 7), electrostimulation (SMD 1.18, 95% CI 0.63 to 1.73, P < 0.001, 1 trial, 60 participants, Table 7), selective-trunk training (SMD 1.42, 95% CI 1.03 to 1.80, P < 0.001, I^2 = 75%, 6 trials, 147 participants, Table 7), sitting-reaching training (SMD 8.47, 95% CI 6.88 to 10.06, 1 trial, 64 participants), unstable-surface training (SMD 2.11, 95% CI 1.40 to 2.81, P < 0.001, I^2 = 88%, 2 trials, 56 participants) and weight-shift training on trunk function (SMD 0.77, 95% CI 0.11 to 1.43, P = 0.02, I^2 = 22%, 2 trials, 40 participants, Table 7).

There was evidence that the selective-trunk training approach (MD 3.10, 95% CI 2.53 to 3.68, P < 0.001, I^2 = 89%, 5 trials, 130 participants, Table 7) and unstable-surface training approach (MD 1.47, 95% CI 1.19 to 1.75, P < 0.001, I^2 = 72%, 2 trials, 56 participants, Table 7) had an effect on trunk function using the Trunk Impairment Scale 1.0.

Data on the effect of core stability on the Trunk Impairment Scale 1.0 were only available in one trial, so no further analysis could be conducted (Table 7).

No data were available for static inclined-surface training and other approaches of trunk training (Table 7).

Dose-matched therapy in both groups

There was evidence of a positive effect on trunk function (Table 7) when using weight-shift training (SMD 1.10, 95% CI 0.54 to 1.67, P < 0.001, I^2 = 0%, 2 trials, 57 participants), unstable-surface training (SMD 0.93, 95% CI 0.71 to 1.16, P < 0.001, I^2 = 83%, 11 trials, 375 participants), static inclined-surface training (SMD 0.92, 95% CI 0.38 to 1.47, P < 0.001, I^2 = 0%, 2 trials, 58 participants, I^2 = 0%), sitting-reaching training (SMD 0.44, 95% CI 0.02 to 0.87, P = 0.004, I^2 = 89%, 4 trials, 104 participants), selective-trunk training (SMD 1.46, 95% CI 1.18 to 1.73, P < 0.001, I^2 = 41%, 8 trials, 281 participants), electrostimulation (SMD 1.57, 95% CI 1.16 to 1.98, P < 0.001, I^2 = 74%, 5 trials, 131 participants) and core-stability training (SMD 0.99, 95% CI 0.75 to 1.24, P < 0.001, I^2 = 49%, 8 trials, 297 participants).

When trunk function was measured using the Trunk Impairment Scale 1.0, selective-trunk training (MD 1.92, 95% CI 1.54 to 2.30, P < 0.001, I^2 = 92% 5 trials, 168 participants), electrostimulation (MD 2.90, 95% CI 2.35 to 3.44, P < 0.001, I^2 = 84%, 6 trials, 151 participants), unstable-surface training (SMD 1.53, 95% CI 1.16 to 1.89, P < 0.001, I^2 = 91%, 8 trials, 273 participants), and core-stability training (MD 2.06, 95% CI 1.60 to 2.53, P < 0.001, I^2 = 64%, 7 trials, 255 participants) all had a positive effect (Table 7).

Data on the effect of other approaches of trunk training were only available in one trial, so no further analysis could be conducted (Table 7).

Effect of trunk training on trunk function: time post-stroke analysis

For eight trials, no specific data were presented of time post stroke.

Non-dose-matched therapy in both groups

Data from 12 studies (378 participants) could be pooled in the phase post-stroke analysis for trials receiving non-dose-matched therapy evaluating the effect of trunk training on trunk function (Table 8). Time post stroke did not result in a significant subgroup difference (P = 0.08).

Trunk function measured by the Trunk Impairment Scale in non-dose-matched therapy trials yielded a significant group difference (P < 0.001, 8 trials, 232 participants, Table 8), meaning that phase post stroke significantly influenced the effect.

Dose-matched therapy in both groups

Thirty-one included trials where both groups received dose-matched therapy could be pooled. Twelve trials with 402 participants were conducted in the early subacute phase (SMD 1.00, 95% CI 0.78 to 1.21, I^2 = 54%), three trials with 93 participants were included in the late rehabilitation phase (SMD 1.56, 95% CI 1.08 to 2.05, I^2 = 72%), and 16 trials with 601 participants in the chronic phase (SMD 1.03, 95% CI 0.85 to 1.21, I^2 = 74%). All comparisons demonstrated an effect in favour of trunk training, with a significant subgroup difference (P = 0.03, Table 8).

The Trunk Impairment Scale 1.0 was used in evaluation of trunk training. Again, all comparisons demonstrated an effect in favour of trunk training and phase post stroke was a modifier of the effect of the intervention on the Trunk Impairment Scale (P < 0.001, Table 8).

Phase post stroke was only measured in three trials by the modified Functional Reach test (Table 8). Due to the limited numbers, no subgroup analysis could be conducted.

Effect of trunk training on trunk function: meta-regression

Difference between the intensity of therapy between groups (minutes of study training in the experimental group minus minutes of study training in the control group) was a significant effect modifier (P < 0.0476, Table 10). Study quality, age of participants, amount of additional training in both arms, length of intervention, pre-intervention outcome level, different phases post stroke, and

time post stroke without the intervention period were not potential modifiers.

Including intensity of therapy (differences in minutes of training between groups) as a modifier in a mixed-effects model led to only a small part (0.028%) of the total heterogeneity being explained.

Secondary outcome - effect of trunk training on arm-hand function

Evidence of an effect of trunk training on arm-hand function was found for the non-dose-matched analysis (SMD 0.67, 95% CI 0.19 to 1.15, P < 0.01, 2 trials, 74 participants, I^2 = 60, low-quality evidence, Analysis 1.3, Table 9). No evidence of an effect of trunk training on arm-hand function was found for the dose-matched analysis (SMD 0.76, 95% CI -0.18 to 1.70, P = 0.11, 1 trial, 19 participants, low-quality evidence, Analysis 2.3, Table 9).

Effect of trunk training on arm-hand function: sensitivity analyses

Sensitivity analysis random-effects model

Sensitivity analysis did modify the effect of trunk training for the non-dose-matched analysis (from evidence of an effect to no evidence of an effect), SMD 1.02, 95% CI -0.27 to 2.31, I^2 = 60%, 2 trials, 74 participants, low-quality evidence, Table 9) but not for the dose-matched analysis (SMD 0.76, 95% CI -0.18 to 1.70, 1 trial, 19 participants, low-quality evidence, Table 9).

Sensitivity analysis risk of bias

One study was scored as high risk of bias. After exclusion, the result remained in favour of trunk training for the non-dose-matched analysis (SMD 0.55, 95% CI 0.05 to 1.05, P = 0.03, 1 trial, 64 participants, low-quality evidence, Table 9). No trials were excluded in the dose-matched analysis.

Sensitivity analysis excluding calculated mean change score trials

There were no trials with calculated mean change scores, therefore this sensitivity analysis is not applicable.

Effect of the different trunk therapy approaches on arm-hand function

Non-dose-matched therapy in both groups

No data were available for core-stability training, electrostimulation, selective-trunk training, static inclined-surface training, unstable-surface training and other types of trunk training.

Weight-shift training and sitting-reaching training were evaluated in one trial (Table 7).

Dose-matched therapy in both groups

Only data from one trial were available evaluating the effect of core stability on arm-hand function (Table 7).

Effect of trunk training on arm-hand function: time post-stroke analysis and meta-regression

Fewer than six trials could be retained. Therefore, a subgroup analysis is not appropriate.

Secondary outcome - effect of trunk training on arm-hand activity

The effect of trunk training on arm-hand activity (30 participants) was examined in one non-dose-matched trial. Training had effect on arm-hand activity (SMD 0.84, 95% CI 0.09 to 1.59, P = 0.03, low-quality evidence, Analysis 1.4, Summary of findings 1). Pooling the results of three dose-matched trials led to no evidence of an effect in favour of trunk training (SMD 0.17, 95% CI -0.21 to 0.56, P = 0.38, 3 trials, 112 participants, I^2 = 88%, low-quality evidence, Analysis 2.4, Summary of findings 2).

Effect of trunk training on arm-hand activity: sensitivity analyses

Sensitivity analysis random-effects model

Pooling of the effect of the original analysis using a random-effects model in three dose-matched studies did not alter the overall effect (SMD 0.48, 95% CI -0.68 to 1.63, P = 0.42, I^2 = 88%, very low-quality evidence, Table 9). Also, for the non-dose-matched analysis, the random-effects model did not change the overall effect in the non-dose-matched analysis (SMD 0.84, 95% CI 0.09 to 1.59, P = 0.03, 1 trial, 30 participants, I^2 = 88%, very low-quality evidence, Table 9).

Sensitivity analysis risk of bias

Only one study was excluded in the dose-matched analysis because of a high risk of bias (Table 9). There was no evidence that risk of bias changed the effect of the overall effect on arm-hand activity (SMD -0.16, 95% CI -0.59 to 0.27, P = 0.46, 2 trials, 86 participants, low-quality evidence).

Sensitivity analysis excluding calculated mean change scores trials

Full data were provided for all four trials, therefore, it was not feasible to execute a sensitivity analysis.

Effect of the different trunk therapy approaches on arm-hand activity

Non-dose-matched therapy in both groups

The effect of core stability, electrostimulation, selective-trunk training, static inclined-surface training, sitting-reaching training and unstable-surface training were not evaluated on arm-hand function (Table 7).

The effect of weight-shift training and other types of trunk training were only measured in one trial for the outcome (Table 7).

Dose-matched therapy in both groups

The effect of dose-matched core stability, electrostimulation, static inclined-surface training, sitting-reaching training, unstable-surface training and weight-shift training were not evaluated on arm-hand function (Table 7).

The effect of selective-trunk training, sitting-reaching training and other types of trunk training were evaluated in only one trial (Table 7).

Effect of trunk training on arm-hand activity: time post-stroke analysis and meta-regression

Fewer than six trials could be retained. Therefore, a subgroup analysis is not appropriate.

Secondary outcome - effect of trunk training on standing balance

In the analysis of trials, non-dose-matched therapy showed an effect on standing balance in favour of trunk training (SMD 0.57, 95% CI 0.35 to 0.79, P < 0.001, I^2 = 93%, 11 trials, 411 participants, very low-quality of evidence, Analysis 1.5, Table 9). In the dose-matched therapy analysis, trunk training led to a positive effect of SMD 1.00, 95% CI 0.85 to 1.15 (P < 0.001, I^2 = 88%, 22 trials, 919 participants, low-quality evidence, Analysis 2.5, Table 9).

Of that group where results were measured by means of the Berg Balance Scale, pooling seven trials that provided non-dose-matched therapy in the control group led to a positive effect of MD 5.75, 95% CI 5.06 to 6.42 (P < 0.001, I^2 = 98%, 7 trials, 270 participants, very low-quality evidence, Analysis 1.13). Fifteen trials evaluated the effect of dose-matched trunk training using the Berg Balance Scale with an MD 2.22, 95% CI 1.93 to 2.51 (P < 0.001, I^2 = 96%, 15 trials, 648 participants, very low-quality evidence, Analysis 2.13).

Egger's test and funnel plot suggest potential publication bias (Figure 8, Figure 9, Table 6).

Figure 8. Figure 8: Funnel plot (1.5 Standing balance, experimental training vs control group, non-dose-matched therapy in control group)

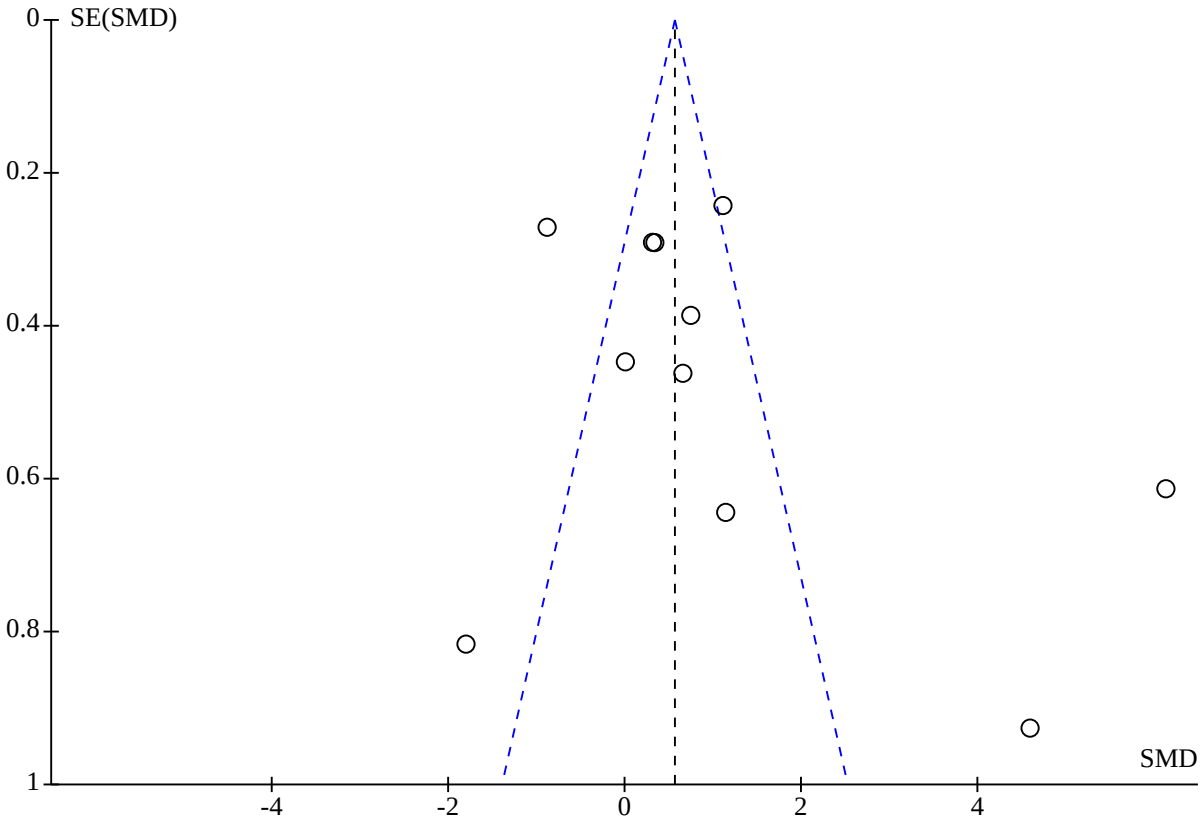
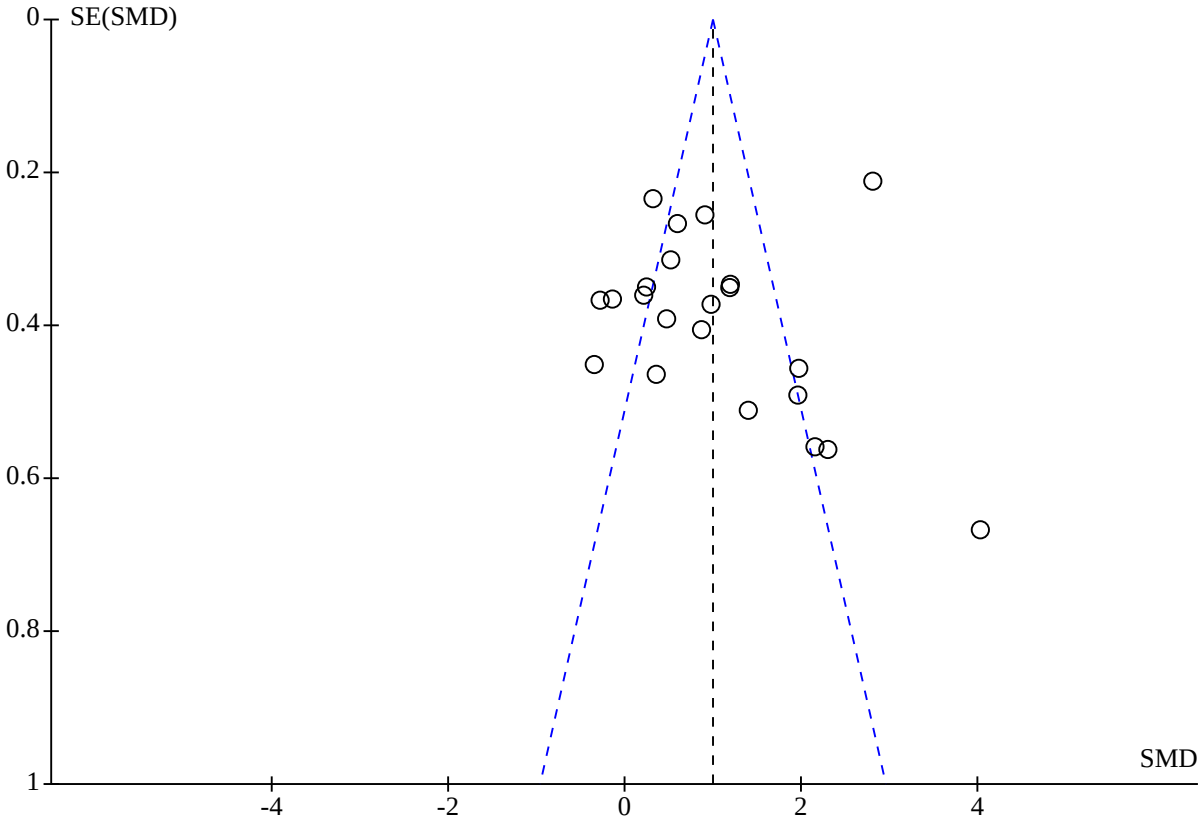


Figure 9. Figure 9: Funnel plot (2.5 Standing balance, experimental training vs control group, dose-matched therapy in control group)



Effect of trunk training on standing balance: sensitivity analyses

Sensitivity analysis random-effects model

When performing the sensitivity analysis, pooling the result using the random-effects model resulted likewise in favour of trunk training for the outcome standing balance for the non-dose-matched analysis (SMD 1.05, 95% CI 0.15 to 1.94, P = 0.02, 11 trials, 410 participants, I^2 = 93%, low-quality evidence, Table 9) and for the dose-matched analysis (SMD 1.03, 95% CI 0.60 to 1.46, P < 0.001, 22 trials, 917 participants, I^2 = 88%, low-quality evidence, Table 9).

Standing balance, measured by means of the Berg Balance Scale, also resulted in an effect in favour of trunk training in the dose-matched analysis (MD 3.31, 95% CI 1.50 to 5.12, P < 0.001, 15 trials, 647 participants, I^2 = 96%, low-quality evidence, Table 9) but not for the non-dose-matched analysis (MD 4.76, 95% CI -1.55 to 11.06, P = 0.14, I^2 = 98%, low-quality evidence, Table 9).

Sensitivity analysis risk of bias

Of the 11 studies evaluating standing balance in the non-dose-matched analysis, four were evaluated as studies with a high risk of bias. After excluding these studies, the direction of the overall effect did not alter (SMD 0.72, 95% CI 0.45 to 1.00, P < 0.001, I^2 = 96%, 7 trials, 300 participants, very low-quality evidence, Table 9, Table 4). In the analysis of dose-matched therapy in the two groups, 13 trials were removed because of high risk of bias. The direction of effect remained in favour of trunk training here as well (SMD 0.87, 95% CI 0.60 to 1.14, P < 0.001, I^2 = 75%, 9 trials, 254 participants, very low-quality evidence, Table 9, Table 4).

There was evidence of an effect for trials reporting the Berg Balance Scale in the non-dose-matched trials subgroup (MD 9.23, 95% CI 8.40 to 10.06, P < 0.001, I^2 = 98%, 5 trials, 212 participants), and no evidence of an effect in favour of trunk training when both groups received dose-matched therapy (MD 0.33, 95% CI -0.07 to 0.73, P = 0.10, I^2 = 69%, 5 trials, 139 participants).

Sensitivity analysis excluding calculated mean change scores trials

Combining the trials where all data was provided did not alter the direction of the effect in favour of trunk training in the non-dose-matched analysis (SMD 0.59, 95% CI 0.40 to 0.77, P < 0.001, I^2 = 84%, 14 trials, 512 participants, low-quality evidence, Table 9). Subgroup analysis showed a significant effect of therapy amount in the control group (P = 0.02). There was evidence of an effect when both groups received dose-matched therapy (SMD 0.98, 95% CI 0.70 to 1.27, P < 0.001, I^2 = 77%, 7 trials, 232 participants, Table 9).

Excluding trials where all data were provided using the Berg Balance Scale also did not alter the positive effect in the dose-matched analysis (MD 0.60, 95% CI 0.22 to 0.98, P < 0.001, I^2 = 83%, 9 trials, 286 participants, very low-quality evidence, Table 9). However, it resulted in an alteration towards no effect in the non-dose-matched analysis (MD 0.67, 95% CI -0.24 to 1.59, P = 0.15, I^2 = 94%, 6 trials, 250 participants, very low-quality evidence, Table 9).

Effect of the different trunk therapy approaches on standing balance

Non-dose-matched therapy in both groups

There was evidence of an effect of core stability on standing balance (SMD 0.83, 95% CI 0.45 to 1.21, P < 0.001, I^2 = 59%, 3 trials, 120 participants, Table 7), and an effect of core stability on standing balance measured using the Berg Balance Scale (MD 4.62, 95% CI 2.08 to 7.17, P < 0.001, I^2 = 87%, 3 trials, 119 participants, Table 7). Selective-trunk training had a positive effect on standing balance (SMD 1.28, 95% CI 0.67 to 1.89, P < 0.001, I^2 = 86%, 3 trials, 61 participants, Table 7).

Only one trial determined the effect on standing balance when using sitting-reaching training, unstable-surface training, weight-shift training, or other approaches of trunk training (Table 7).

The effect of electrostimulation on standing balance was not evaluated (Table 7).

Dose-matched therapy in both groups

Core-stability training (SMD 1.31, 95% CI 1.08 to 1.54, P < 0.001, I^2 = 93%, 8 trials, 403 participants), selective-trunk training (SMD 0.91, 95% CI 0.59 to 1.23, P < 0.001, I^2 = 0%, 4 trials, 171 participants) and unstable-surface training (SMD 0.84, 95% CI 0.58 to 1.11, P < 0.001, I^2 = 86%, 7 trials, 261 participants) all had a positive effect in favour of the trunk training approach on standing balance (Table 7). There was no evidence of an effect of electrostimulation on standing balance (SMD 0.51, 95% CI -0.00 to 1.03, P = 0.05, I^2 = 26%, 2 trials, 63 participants).

Combining the results of the sitting-boxing programme and motor imagery trunk training led to a positive effect for standing balance (SMD 2.05, 95% CI 1.33 to 2.77, P < 0.001, I^2 = 0%, 2 trials, 48 participants, Table 7).

Only data from one trial of weight-shift training were available (Table 7).

No trials evaluated the effect of sitting-reaching training and static inclined-surface training on standing balance (Table 7).

The effect of core-stability training on standing balance measured using the Berg Balance Scale resulted in a positive effect in favour of the trunk training approach (MD 2.11, 95% CI 1.77 to 2.45, P < 0.001, I^2 = 98%, 7 trials, 308 participants, Table 7). Also, selective-trunk training resulted in an effect in favour of standing balance measured using the Berg Balance Scale (MD 1.75, 95% CI 0.28 to 3.22, P = 0.02, I^2 = 84%, 2 trials, 75 participants). Unstable-surface trunk training had a positive effect on standing balance evaluated by the Berg Balance Scale (MD 3.38, 95% CI 2.59 to 4.18, P < 0.001, I^2 = 95%, 5 trials, 176 participants, Table 7).

Effect of trunk training on standing balance: time post-stroke analysis

For five trials, no specific data were presented for time post stroke.

Non-dose-matched therapy in both groups

In 10 of the remaining 26 trials, non-dose-matched therapy (351 participants) was offered to the control group. A significant subgroup difference was present (P < 0.001), meaning that time post stroke significantly influences the direction and the size of the effect (Table 8).

The Berg Balance Scale was evaluated in 7 trials (271 participants). Also here, across comparisons, there was a significant subgroup difference (P < 0.001, Table 8).

Dose-matched therapy in both groups

Of the 26 remaining trials, 18 trials received dose-matched therapy (775 participants, Table 8). We found a significant subgroup difference (P < 0.001). This suggested that phase post stroke modified the effect of the intervention.

Across comparisons, there was a significant subgroup difference for standing balance evaluated by means of the Berg Balance Scale (P < 0.001, Table 8). In this analysis, phase post stroke had an influence on size and direction of the effect.

Effect of trunk training on standing balance: meta-regression

Study quality, age of participants, amount of additional training in both arms, amount of conventional therapy in both arms, length of intervention, pre-intervention outcome level, different phases post stroke, and time post stroke without an intervention period were not potential effect modifiers (Table 10).

Secondary outcome - effect of trunk training on leg function

One trial (64 participants) provided additional training in the experimental group favouring trunk training (SMD 1.10, 95% CI 0.57 to 1.63, P < 0.001, very low-quality evidence, Analysis 1.6). Four trials (254 participants) provided the same therapy amount in both study arms favouring trunk training (SMD 1.57, 95% CI 1.28 to 1.87, P < 0.001, I^2 = 93%, very low-quality evidence, Analysis 2.6).

Effect of trunk training on leg function: sensitivity analyses

Sensitivity analysis random-effects model

In the random-effects sensitivity analysis, the overall effect remained in favour of trunk training on leg function in the non-dose-matched analysis (SMD 1.10, 95% CI 0.57 to 1.63, P < 0.001, very low-quality evidence, Table 9) and in dose-matched analysis (SMD 1.51, 95% CI 0.05 to 2.96, P = 0.04, very low-quality evidence, Table 9).

Sensitivity analysis risk of bias

The trial in the non-dose-matched analysis had an acceptable risk of bias. Three trials in the dose-matched analysis had acceptable risk of bias and showed also an effect in favour of trunk training (SMD 0.65, 95% CI 0.11 to 1.18, P < 0.001, I^2 = 93%, 3 trials, 74 participants, low-quality evidence, Table 9).

Sensitivity analysis excluding calculated mean change score trials

All information (mean change scores and their standard deviations) were provided for these trials, therefore, this sensitivity analysis is not applicable.

Effect of the different trunk therapy approaches on leg function

Non-dose-matched therapy in both groups

For sitting-reaching training, only data from one trial were available. No further analysis could be conducted.

Dose-matched therapy in both groups

Core-stability training had a positive effect on leg function (SMD 1.82, 95% CI 1.48 to 2.15, P < 0.001, I^2 = 86%, 2 trials, 199 participants, Table 7). For leg function, there was no evidence of an effect (SMD 0.64, 95% CI -0.01 to 1.30, P = 0.06, I^2 = 96%, 2 trials, 55 participants, Table 7) when applying selective-trunk training.

Effect of trunk training on leg function: time post-stroke analysis and meta-regression

Fewer than six trials could be retained. Therefore, a subgroup analysis is not appropriate.

Secondary outcome - effect of trunk training on walking ability

In this review, the results of 11 trials could be pooled (383 participants) for the non-dose-matched analysis. Trunk training resulted in an overall effect of SMD 0.73, 95% CI 0.52 to 0.94 (P < 0.001, I^2 = 30%, low-quality evidence, Analysis 1.7). In the dose-matched analysis, trunk training also resulted in a positive effect (SMD 0.69, 95% CI 0.51 to 0.87, P < 0.001, 19 trials, 535 participants, I^2 = 51%, very low-quality evidence, Analysis 2.7). Egger's test and funnel plot suggest no potential publication bias (Figure 10, Figure 11, Table 10).

Figure 10. Figure 10: Funnel plot (1.7 Walking ability, Experimental training vs control group, non-dose-matched therapy in control group)

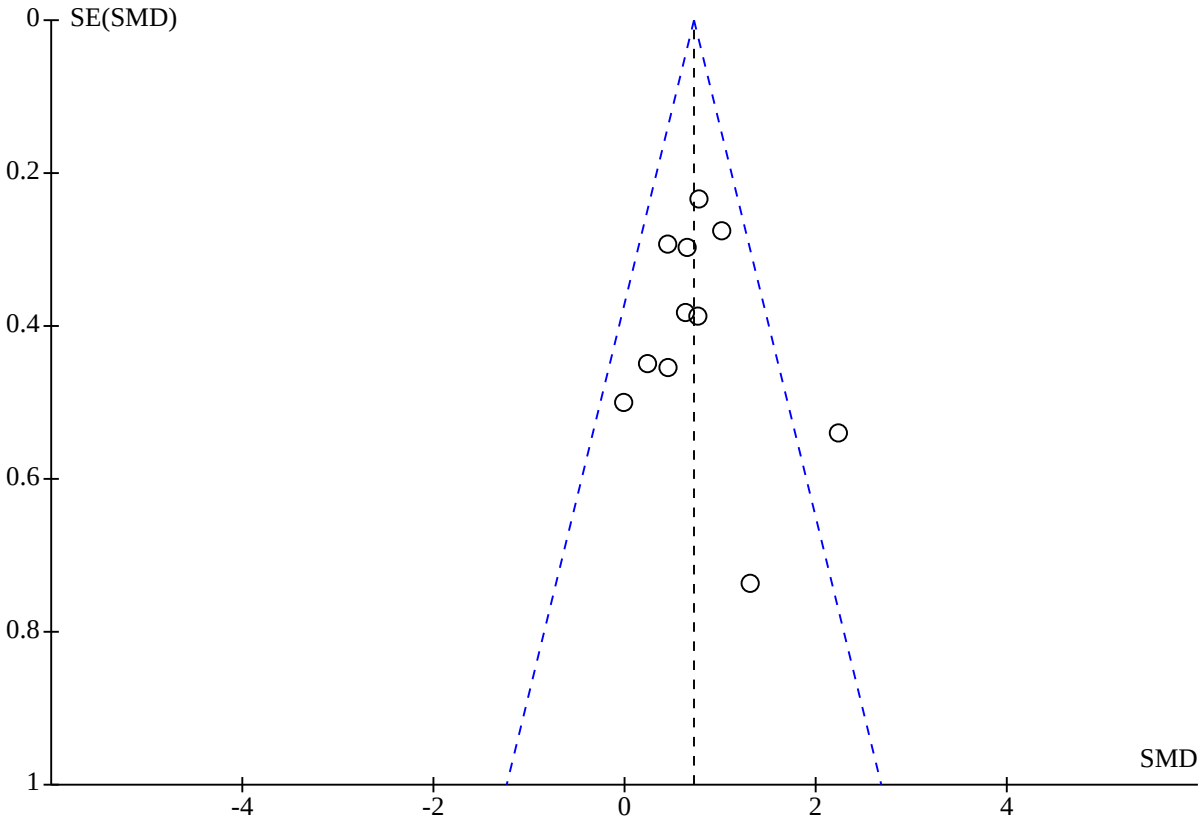
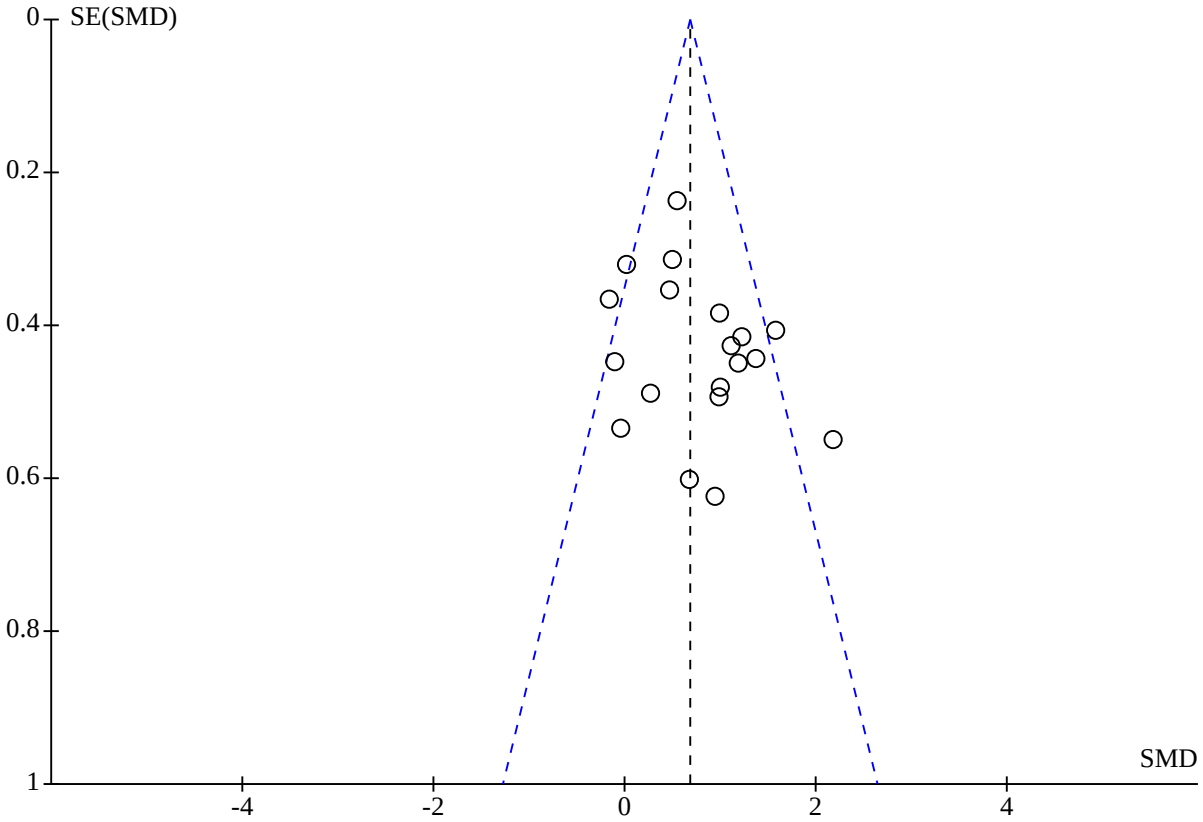


Figure 11. Figure 11: Funnel plot (2.7 Walking ability, experimental training vs control group, dose-matched therapy in control group)



Walking ability was evaluated by the Timed Up and Go in seven trials (170 participants) in the non-dose-matched analysis and evidence of an effect was found in favour of trunk training (MD -0.46, 95% CI -0.75 to -0.17, P = 0.002, I^2 = 93%, very low-quality of evidence, with a lower MD reflecting effects in favour of trunk training, Analysis 1.14). There was no evidence of an effect in favour of trunk training in the dose-matched analysis (MD -0.27, 95% CI -2.24 to 1.70, P = 0.79, I^2 = 66%, very low-quality of evidence, with a lower MD reflecting effects in favour of trunk training, Analysis 2.14).

Evidence was found in favour of trunk training for walking ability assessed using the subpart gait of the Tinetti Scale in the non-dose-matched analysis (MD 1.90, 95% CI 0.96 to 2.84, P < 0.001, 3 trials, 146 participants, I^2 = 0%, low-quality evidence, Analysis 1.15) and in the dose-matched analysis (MD 2.16, 95% CI 1.56 to 2.76, P < 0.001, 4 trials, 171 participants, I^2 = 69%, low-quality evidence, Analysis 2.15).

Walking ability was evaluated by means of the Ten-Meter Walk Test in six trials. There was no evidence of an effect in favour of trunk training for the non-dose-matched analysis (MD 0.06, 95% CI -0.01 to 0.13, P = 0.08, I^2 = 2%, 2 trials, 49 participants, very low-quality evidence, Analysis 1.16) but there was evidence of an effect for dose-matched analysis (MD 0.32, 95% CI 0.01 to 0.62, P = 0.04, I^2 = 80%, 4 trials, 97 participants, very low-quality evidence, Analysis 2.16).

Effect of trunk training on walking ability: sensitivity analyses

Sensitivity analysis random-effects model

Sensitivity analysis using the random-effects model did not alter the overall positive effect for both the non-dose-matched analysis (SMD 0.73, 95% CI 0.46 to 0.99, P < 0.001, I^2 = 30%, 11 trials, 383 participants, very low-quality evidence, random-effects model, Table 9) and for the dose-matched analysis (SMD 0.74, 95% CI 0.47 to 1.01, P < 0.001, I^2 = 51%, 19 trials, 535 participants, very low-quality evidence, random-effects model, Table 9).

Sensitivity analysis of walking ability evaluated by the Timed Up and Go changed the effect to a non-significant result of MD 0.34, 95% CI -2.17 to 2.85 in the non-dose-matched analysis (P = 0.79, I^2 = 93%, 7 trials, 170 participants, very low-quality evidence, Table 9) and in the dose-matched analysis (MD 0.31, 95% CI -4.49 to 5.12, P = 0.90, I^2 = 66%, 5 trials, 99 participants, very low-quality evidence, Table 9).

Sensitivity analysis did not alter the effect that was found in favour of trunk training for walking ability assessed using the gait part of the Tinetti Scale for both the non-dose-matched (MD 1.90, 95% CI 0.96 to 2.84, P < 0.001, I^2 = 0%, 3 trials, 146 participants, very low-quality evidence, Table 9) and for the dose-matched analysis (MD 2.26, 95% CI 1.16 to 3.37, P < 0.001, I^2 = 69%, 4 trials, 171 participants, very low-quality evidence, Table 9).

Walking ability measured by means of the Ten-Meter Walk Test altered the result to a non-significant effect for the non-dose-matched analysis (MD 0.07, 95% CI -0.18 to 0.33, P = 0.57, I^2 = 2%, 2 trials, 49 participants, Table 9) but not for the dose-matched analysis (MD 2.08, 95% CI 0.06 to 4.09, P = 0.04, I^2 = 80%, 4 trials, 97 participants, Table 9).

Sensitivity analysis risk of bias

Eleven trials were excluded due to high risk of bias.

Exclusion of the trials due to high risk of bias in the non-dose-matched analysis resulted as well in an effect in favour of trunk training of SMD 0.77, 95% CI 0.53 to 1.00 (P < 0.001, I^2 = 38%, 8 trials, 309 participants, very low-quality evidence, Table 9) and an effect in favour of trunk training in the dose-matched analysis SMD 0.79, 95% CI 0.53 to 1.04 (P < 0.001, I^2 = 62%, 11 trials, 279 participants, very low-quality evidence, Table 9).

For the Timed Up and Go, three trials were excluded in the non-dose-matched analysis due to high risk of bias. Pooling the remaining trials led to an alteration of the effect (MD -0.19, 95% CI -0.50 to 0.11, P = 0.21, I^2 = 92%, 4 trials, 127 participants, Table 9). We found no evidence of an effect in the dose-matched analysis (MD 0.15, 95% CI -1.96 to 2.27, P = 0.89, I^2 = 77%, 3 trials, 66 participants, low-quality evidence, Table 9).

Two trials were excluded due to high risk of bias; because of the small number of included trials, no further analysis could be conducted for the outcome using the Ten-Meter Walk Test and the Tinetti Gait.

Sensitivity analysis excluding calculated mean change score trials

The change score was calculated in 12 trials. Excluding these trials resulted in no alteration of the direction of the effect in the non-dose-matched analysis (in favour of trunk training, SMD 0.80, 95% CI 0.51 to 1.09, P < 0.001, 7 trials, 209 participants, I^2 = 43%, moderate-quality evidence, Table 9) and in favour of trunk training in the dose-matched analysis (SMD 0.78, 95% CI 0.56 to 0.99, P < 0.001, 13 trials, 392 participants, I^2 = 46%, moderate-quality evidence, Table 9).

After excluding one trial where mean change score was calculated in the non-dose-matched analysis, the direction of the overall effect did not change for trials reporting on Timed Up and Go (MD -2.05, 95% CI -2.90 to -1.19, P < 0.001, I^2 = 93%, 6 trials, 122 participants, very low-quality of evidence, with a lower MD reflecting effects in favour of trunk training, Table 9). For the dose-matched analysis two trials were excluded, however, the result of no evidence of an effect remained in this analysis (MD -0.16, 95% CI -2.28 to 1.97, P = 0.88, I^2 = 82%, 3 trials, 62 participants, very low-quality of evidence, with a lower MD reflecting effects in favour of trunk training, Table 9).

Effect of the different trunk therapy approaches on walking ability

Non-dose-matched therapy in both groups

There was evidence of an effect on walking ability (Table 7) when applying core-stability training (SMD 0.51, 95% CI 0.17 to 0.8, P = 0.003, I^2 = 0%, 4 trials, 140 participants) and selective-trunk training (SMD 1.01, 95% CI 0.54 to 1.49, P < 0.001, I^2 = 69%, 3 trials, 82 participants).

Only data of one trial were available for electrostimulation, unstable-surface training, and other approaches of trunk training, so no further analysis was applicable (Table 7).

No data were available for the trunk training approach sitting-reaching training, or static inclined-surface training (Table 7).

Dose-matched therapy in both groups

Core-stability training had a positive effect on walking ability (SMD 1.22, 95% CI 0.74 to 1.69, P < 0.001, I^2 = 22%, 4 trials, 86 participants, Table 7). sitting-reaching training (SMD 0.88, 95% CI 0.14 to 1.61, P = 0.02, I^2 = 0%, 2 trials, 32 participants, Table 7) and unstable-surface training (SMD 0.41, 95% CI 0.06 to 0.77, P = 0.02, I^2 = 60%, 4 trials, 129 participants) also had a positive effect on walking ability.

There was no evidence of an effect when pooling trials using electrostimulation (SMD 0.32, 95% CI -0.26 to 0.89, P = 0.28, I^2 = 0%, 2 trials, 47 participants, Table 7).

Training using the selective-trunk training approach resulted in a positive effect in favour of selective-trunk training on walking ability (SMD 0.66, 95% CI 0.38 to 0.93, P < 0.001, I^2 = 63%, 6 trials, 226 participants, Table 7) and walking ability measured using Tinetti Gait (MD 2.43, 95% CI 1.72 to 3.14, P < 0.001, I^2 = 74%, 3 trials, 157 participants, Table 7).

For electrostimulation, the outcome of Tinetti gait (Table 7) and the outcome of weight-shift training and other approaches of trunk training on walking ability was assessed in one trial, therefore, no further analysis was conducted for electrostimulation (Table 7).

There were no data available using the static inclined-surface training (Table 7).

Effect of trunk training on walking ability: time post-stroke analysis

Of all studies, 24 studies could be assigned into the different phases after a stroke.

Non-dose-matched therapy in both groups

Participants in ten trials received different dose of therapies in both groups. There was no significant subgroup difference (P = 0.83).

Walking ability was measured in seven trials using the Timed Up and Go test (lower score presenting better outcome). There was a subgroup effect by time post stroke (P = 0.03), suggesting that phase post stroke significantly influences the direction of the effect or effect size (Table 8).

Walking ability was evaluated in only three trials by means of the Tinetti Gait. Due to the limited number of trials for these outcomes, no further analysis was executed.

Dose-matched therapy in both groups

There was a significant subgroup difference (P = 0.003), suggesting that phase post stroke did significantly influence the effect of the intervention (Table 8).

Also, here walking ability was evaluated in four trials by means of the Timed Up and Go test and in three trials by means of the Tinetti

Gait. Due to the limited number of trials for these outcomes, no further analysis was executed.

Effect of trunk training on walking ability: meta-regression

Study quality; age of participants; amount of additional training in both arms; amount of conventional therapy in both arms; length of intervention; pre-intervention outcome level; different phases post stroke and time post stroke without an intervention period were not potential effect modifiers (Table 10).

Secondary outcome - effect of trunk training on quality of life

Two trials (108 participants) evaluated the effect of trunk training on quality of life. Meta-analysis resulted in a SMD of 0.50, 95% CI 0.11 to 0.89 for the non-dose-matched analysis (P = 0.01, I^2 = 51%, low-quality evidence, Analysis 1.8, Summary of findings 1). Pooling two other trials with dose-matched therapy in the experimental and control group resulted in evidence of an effect in favour of trunk training (SMD 0.70, 95% CI 0.29 to 1.11, P < 0.001, I^2 = 74%, 111 participants, low-quality evidence, Analysis 2.8, Summary of findings 2).

Effect of trunk training on quality of life: sensitivity analyses

Sensitivity analysis random-effects model

Results of the sensitivity analysis differed from the main analyses in both the non-dose-matched analysis (SMD 0.49, 95% CI -0.06 to 1.04 in favour of trunk training, alteration from evidence of an effect to no evidence of an effect, P = 0.08, I^2 = 51%, 2 trials, 108 participants, low-quality evidence, Table 9) and also in the dose-matched analysis (SMD 0.92, 95% CI -0.06 to 1.89 in favour of trunk training, alteration from evidence of an effect to no evidence of an effect, P = 0.07, I^2 = 74%, 2 trials, 111 participants, low-quality evidence, Table 9).

Sensitivity analysis risk of bias

No trials were excluded in the non-dose-matched analysis (SMD 0.50, 95% CI 0.11 to 0.89, P = 0.01, I^2 = 51%, 108 participants, Table 9). Both trials scored high on risk of bias analysis in the dose-matched analysis.

Sensitivity analysis excluding calculated mean change score trials

Both change scores were calculated in the non-dose-matched analysis and none in the dose-matched analysis (SMD 0.70, 95% CI 0.29 to 1.11, P < 0.001, I^2 = 74%, 111 participants, low-quality evidence, Table 9).

Effect of the different trunk therapy approaches on quality of life

Non-dose-matched therapy in both groups

The effect of electrostimulation and other types of trunk training were only evaluated in one trial. No other trunk training approaches were available (Table 7).

Dose-matched therapy in both groups

The effect of selective-trunk training, unstable-surface training and other types of trunk training were only evaluated in one trial. No other trunk training approaches were available (Table 7).

Effect of trunk training on quality of life: time post-stroke analysis

Too few data were available for further analysis.

Effect of trunk training on death and serious adverse events, including falls

Sixt trials (201 participants) with non-dose-matched therapy in the experimental and control groups reported on serious adverse events comparing trunk training with the control group. In that analysis, one trial reported a fall incidence during the study (Thijs 2021). As described in Data synthesis, we used a fixed-effects model for meta-analysis of dichotomous data. Meta-analysis resulted in an OR of 7.94 (95% CI 0.16 to 400.89; P = 0.30, very low-quality evidence, Analysis 1.9, Summary of findings 1), suggesting that there is no evidence of an effect of trunk training on adverse events in the non-dose-matched analysis. The same results were observed for the dose-matched analysis (OR 7.39, 95% CI 0.15 to 372.38, P = 0.32, 10 trials, 381 participants, very low-quality evidence, Analysis 2.9, Summary of findings 2). In this analysis, one trial also reported a fall incidence (Dean 2007).

Effect of trunk training on death and serious adverse events, including falls: sensitivity analyses

Sensitivity analysis random-effects model

Sensitivity analysis did not alter the effect in the non-dose-matched analysis (OR 3.44, 95% CI 0.13 to 91.79, P = 0.46, 6 trials, 201 participants, Table 9) or in the dose-matched analysis (OR 3.55, 95% CI 0.12 to 105.82, P = 0.47, 10 trials, 381 participants, Table 9).

Sensitivity analysis risk of bias

Sensitivity analysis did not alter the effect in the non-dose-matched analysis (OR 7.94, 95% CI 0.16 to 400.89, P = 0.30, 5 trials, 151 participants, Table 9), nor in the dose-matched analysis (OR 7.39, 95% CI 0.15 to 372.38, P = 0.32, 7 trials, 224 participants, Table 9).

Sensitivity analysis excluding calculated mean change scores

Sensitivity analysis did not alter the effect in the non-dose-matched analysis (OR 7.94, 95% CI 0.16 to 400.89, P = 0.30, 5 trials, 153 participants, Table 9) or in the dose-matched analysis (OR 7.39, 95% CI 0.15 to 372.38, P = 0.32, 10 trials, 381 participants, Table 9).

Effect of the different trunk therapy approaches on death and serious adverse events, including falls

Non-dose-matched therapy in both groups

There was no evidence of an effect of selective-trunk training on serious adverse events and falling (OR 7.94, 95% CI 0.16 to 400.89, 53 participants, 2 trials, Table 7).

Dose-matched therapy in both groups

There was no evidence of an effect of sitting-reaching training on serious adverse events and falling (OR 7.39, 95% CI 0.15 to 372.38, 85 participants, 3 trials, Table 7).

Effect of trunk training on trunk function: time post-stroke analysis

Non-dose-matched therapy in both groups

Subgroup analysis of time post stroke was not applicable (Table 8).

Dose-matched therapy in both groups

Subgroup analysis of time post stroke was not applicable (Table 8).

Effect of trunk training on death and serious adverse events, including falls: meta-regression

Meta-regression was not possible, due to the limited amount of information.

DISCUSSION

This review aimed to determine the effectiveness of trunk training after stroke on activities of daily living, motor and functional status, and quality of life.

We conducted an extensive search up to 25 October 2021 and identified 68 trials including 2585 participants in total.

We found data for the different outcomes. Additionally, we assessed the effects of the intervention where amount of therapy offered as a control intervention equalled, or was reduced in comparison to the experimental intervention. Furthermore, this review evaluated the effect of time post stroke and different types of trunk training.

Summary of main results

The main results are presented in the Summary of findings 1, Summary of findings 2 and Table 9.

Fourteen trials with 512 participants used our primary outcome measure to explore the effect of trunk training on activities of daily living versus a control intervention. Pooling data demonstrated evidence of an effect when comparing with non-dose-matched control treatment (very low quality of evidence), but not for dose-matched control treatment (very low quality of evidence). Regarding trunk training approaches, we found evidence of an effect for sitting-reaching training in the non-dose-matched analysis and for unstable-surface training in the dose-matched analysis. There was either no evidence of an effect for the other approaches or the number of included trials were limited.

Most of the included studies evaluated the effect of trunk training on trunk function (50 trials, 1679 participants). For dose-matched (very low-quality evidence) and non-dose-matched comparisons (very low-quality evidence), and for all trunk training approaches, a positive effect was seen in favour of trunk training. Non-dose-matched electrostimulation and sitting-reaching training and dose-matched trunk exercises in combination with motor imagery was only assessed in one trial.

The number of trials examining the impact of trunk training on arm-hand function was notably lower; just three trials (93 participants) evaluated the effect of trunk training on this outcome. When pooling the two non-dose-matched trials and one dose-matched trial, we noted no evidence of an effect in favour of trunk training (low-quality evidence). For arm-hand activity, only one trial could be included for both non-dose-matched as dose-matched analysis (very low-quality evidence). Trunk training approaches were only evaluated in a maximum of one trial.

The effect of trunk training on standing balance was extensively reported in 33 trials (1330 participants). There was evidence of an effect of trunk training on standing balance in both dose-matched (very low-quality evidence) and non-dose-matched comparisons (very low-quality evidence). Trunk training approaches using core-stability training and selective-trunk training showed evidence of an effect in the non-dose-matched comparisons. Trunk training approaches involving core-stability training, electrostimulation, selective-trunk training, unstable-surface training and other types of trunk training likewise showed evidence of an effect in the dose-matched analysis. For the other therapy approaches, only data from one trial were available.

The effects of trunk training on leg function was evaluated in five trials (318 participants) and a positive effect was seen in favour of trunk training in both the non-dose-matched (very low-quality evidence) and the dose-matched analysis (very low-quality evidence). We found evidence of an effect of core-stability training on this outcome. Pooling data of two trials applying a selective-trunk training approach resulted in no evidence of an effect. Evaluating the effect of other trunk training approaches was limited due to a low number of trials within each trunk training approach.

Walking ability was investigated in 30 trials (893 participants). There was evidence of an effect when pooling trials in the dose-matched (low-quality evidence) and non-dose-matched comparisons (very low-quality evidence). We also noted a difference in favour of trunk training for the therapy approaches core-stability training and selective training in the dose-matched trials and for the therapy approaches core-stability training, electrostimulation, selective-trunk training, sitting-reaching training and unstable-surface training in the non-dose-matched trials. For the other therapy approaches, only data from one trial were available.

Four trials with 219 participants evaluated the effect of trunk training on quality of life. Pooling the data of two trials suggests that trunk training may result in better quality of life in both the non-dose-matched and the dose-matched analysis (very low-quality evidence). A conclusion about the effectiveness of trunk training approaches can not be provided due to the low number of trials.

Evaluation of serious adverse events and falling incidence did not resulted in a ratio in favour of the trunk training for both non-dose-matched and for dose-matched analysis (very low-quality evidence). It is important to highlight that only a few trials recorded and reported serious adverse events and falls related to the interventions provided. This element should be included in future trials.

We evaluated the quality of evidence for our results as being of very low to low quality. Main factors responsible for this reduced certainty in our comparisons were low sample sizes, considerable risk of bias and high heterogeneity across trials. Again, these factors should be addressed in future trials.

The sensitivity analysis for imputed calculated standard deviations of change scores did not alter the result and direction of effect on the main outcome measures, except for the outcomes with the Berg Balance scale, arm-hand function and quality of life (all in the random-effects analysis, non-dose-matched analysis). In addition, all evidence showing the benefit of trunk training still showed an effect in favour of trunk training when excluding studies with high risk of bias for all outcomes. Our sensitivity analysis, where we excluded all trials with a high risk of bias, confirmed our results and provided findings with a very low to moderate certainty.

The results suggest that trunk training, beside trunk function itself, has a positive effect on gross motor skills, such as standing balance, walking ability, quality of life and activities of daily living, but less on arm-hand function. The positive effect of trunk training on trunk

function can be explained by the rationale that what is trained probably will improve. Additionally, the trunk can be considered the core of the body. The core is centrally located in the body, and better selectivity, co-ordination, and muscle activation can lead to better gross motor skills primarily necessary for skills such as walking, balance and most activities of daily living. Being able to perform the above functions better and more easily could have a positive effect on quality of life. Better trunk function could provide a better base for the arm but has less influence on the more complex distal functions of the hand, making the effects of improved trunk function less clear for distal arm-hand function.

The results of the analyses of the different outcomes are perhaps more meaningful when comparing the mean between-group differences with the clinical meaningful differences. The minimal clinically important difference for the Barthel Index is a difference of 10 on a 100-point scale (Hsieh 2007). In this review, a MD of 11.58, 95% CI 6.80 to 16.35 was seen in the non-dose-matched analysis, which indicates a greater effect than the clinically important difference. The clinically meaningful difference for the Trunk Impairment Scale was 3.5 points out of 23 (Monticone 2019), whereas the change score in this review was MD 2.88, 95% CI 2.72 to 3.04 for the non-dose-matched analysis and MD 1.87, 95% CI 1.66 to 2.08 for the dose-matched analysis. The clinically meaningful difference for the Berg Balance scale varied from 4 (Tamura 2021) to 12.5 points (Song 2018), out of 56. Pooling data in this review in the non-dose-matched analysis resulted in an improvement of MD 5.75, 95% CI 5.06 to 6.43 and MD 2.22, 95% CI 1.93 to 2.51 in the dose-matched analysis. The clinically meaningful difference for gait speed ranges from 0.13 m/s (Bohannon 2013), to 0.19 m/s (Fulk 2011). The pooled analysis of this review showed a difference in gait speed of MD 0.32, 9% CI 0.01 to 0.62 in the dose-matched analysis. Thus overall, trunk training demonstrates a positive effect, but the magnitude of the mean effect did not exceed the clinically meaningful differences except for the outcome measured by the Barthel Index for the non-dose-matched analysis and gait speed in the dose-matched analysis. An interesting finding is that the effect size for some outcomes is high to very high.

Overall completeness and applicability of evidence

There is a lot of interest in this research field, reflected by the large number of trials that were included in the different analyses.

In general, we found different trials for each outcome measure but also for each trunk training therapy approach. This allowed us to provide an overview of the effects of trunk training, notwithstanding that, for some outcomes such as quality of life, leg function, arm-hand function and arm-hand activity, available evidence is thus far limited. Due to the limited number of studies and methodological differences between the experimental and control groups, it is not possible to decide which approach is the most effective. This is also the case for the analysis according to phase post stroke. What is striking, and important, is that almost none of the studies evaluated and reported adverse events. However, this is an important outcome, and it is needed for clinical applications and should be monitored in future studies.

Additionally, we identified that minimal standard therapy information was lacking for certain therapy approaches. The included comparisons vary from 16 included trials (unstable-surface) to only two included trials (static inclined-surface training). This implies that for static inclined-surface training and other therapy approaches such as sitting-boxing programme, video-based trunk training and trunk exercises in combination with motor imagery, insufficient data are available to provide robust conclusions. In light of the available evidence for other trunk training approaches, future studies should focus on the evidence that is reported in this review to advance the field and focus on uniformity in therapy and measurement outcomes.

We found that the number of study registrations was very limited. As a result, there is no indication whether a post hoc adjustment has been made to the study design, methodology, number of participants or outcome measures. It is, therefore, necessary to treat the interpretation of these included trials with caution.

Some elements reduce the applicability of the findings of therapy suggesting that further research is important. In the inclusion criteria, we often noted that only persons with a limitation in trunk function were included after a first stroke. Also, people with other neurological conditions or multiple strokes were not included in the study population. This makes it difficult to draw conclusions for the general stroke patient population. The setting of the included trials was often a hospital or a specialised rehabilitation department. In only one trial was the study location a home setting. Therefore, the results of this review are less applicable to the home setting, as well as nursing homes or other residential settings for people in the chronic phase.

Most of the trials were conducted with individuals who had their stroke more than six months prior to study inclusion, or in the early subacute phase, i.e. between two weeks and three months after the stroke event. No trials included participants within the first two weeks after the stroke event. No information is available about the applicability of trunk training starting early after stroke, yet based on recovery studies (Jørgensen 2015), this is where most effect could be observed in terms of motor and functional outcome. The results of the sensitivity analysis showed that phase after stroke, mean time post stroke plus intervention time, can influence the effect of trunk training. Surprisingly, there appears to be a difference in the outcome between the phase after stroke and the results of the meta-regression. This can possibly be explained by two factors. On the one hand, the post-stroke variable time was included in the meta-regression without the intervention period and phase post stroke was included as a categorical variable in the meta-regression.

Therapy that was offered was described in the publications, but often without sufficient details that could allow replication or implementation in clinical practice. It is important to report the entire therapy programme either as an appendix or in an online repository or supplementary material. This should include the provided exercises, the changes of levels of exercises (progression), whether it is offered individually, what material is needed, and the intensity of the training applied (number of repetitions or duration in minutes for each exercise).

To investigate the effect of amount of therapy in the control group (dose-matched and non-dose-matched), we performed a subgroup analysis. Nevertheless, we found large variability between the control interventions. The control intervention varied from an active control intervention, such as active strength training, to a passive control therapy, such as cognitive training or health education. This does not give a difference in therapy time, but in therapy intensity, which could have an effect on the results.

The meta-analysis was performed using a fixed-effect model because smaller studies are given less weight than studies with a larger sample size. The sensitivity analysis, using a random-effects model, did not yield noteworthy different results.

Heterogeneity was only minimally explained by using a different model, by sensitivity analysis or by the possible confounders that were included in the meta-regression. This indicates that there may be other variables that may explain the heterogeneity.

The final search date of this review was 25 October 2021. This date is recent; however, the field of interest is rapidly expanding, so it is likely that more studies will be finalised and eligible for inclusion now and in the near future. The advantage of a Cochrane Review is that it is kept up-to-date and updated on a regular basis.

Quality of the evidence

According to the GRADE criteria, the quality of the evidence was very low to moderate. The quality of the evidence was influenced by a high risk of bias, large heterogeneity and a suspected publication bias (Summary of findings 1; Summary of findings 2).

The risk of bias of many of the included studies was high or unclear due to limited provision of study details and methodology and lack of clarification from the trial authors. We found that randomisation was often mentioned in the included trials, but that insufficient details were included so that the randomisation could not be reproduced. In less than half of the included trials, sufficiently detailed information on the randomisation process was provided, and these trials were scored as having low risk of bias. For allocation concealment, for most of the trials, minor details were described and the risk of bias was scored as unclear. Less than half of the included trials were rated as having low risk of bias on this item. Blinding of assessor(s) was clearly described in a considerable number of included trials. Here, trials described that the assessor neither participated in the intervention nor in the treatment allocation. Blinding of participants and personnel scored as being mostly unclear or high risk of bias for all included trials, but this may be considered typical for this type of physical intervention, where blinding of participants is challenging. There was study registration available for only a few of the randomised controlled trials that we included. This means there is a chance of selective reporting. In most trials, numbers of dropouts were reported. Still, often the description of the cause of dropouts was not provided, making interpretation of results difficult.

The findings and direction of effect of the different meta-analyses was quite uniform, nearly exclusively in favour of trunk training. Notwithstanding, heterogeneity of the overall effect sizes of the different analyses was high. Analysis of the difference in training intensity, correction for risk of bias or imputing calculated change scores are possible factors that explain heterogeneity. No significant confounders were found in the meta-regression analysis except for differences in training intensity for the trunk function outcome. Time after stroke did not explain heterogeneity significantly, although some subgroup analyses showed relatively lower heterogeneity.

Heterogeneity can potentially further be explained by methodological diversity or by clinical diversity (Sandercock 2011, Schroll 2011). Factors of methodological diversity and variability of study design, or risk of bias, were partly included in the meta-regression. Factors such as a difference in study length or difference in study quality were taken into account. However, it should be noted that the meta-regression could be more accurate if the full data set of all trials had been available for this analysis instead of the mean and published values. Numerous studies have been found, but often with only small sample sizes and limited quality of study design. This may explain why there can be great diversity in results measured in the different trials, resulting in no overlap in confidence intervals of the different studies and some results situated far from the no effect point, leading to an important influence on heterogeneity. Another reason that could further explain the heterogeneity in the meta-analysis is the clinical diversity or the variability in the participants, interventions and outcomes studied. This can be caused, for example, by differences in baseline characteristics. Factors such as age and time post stroke were included but other factors such as type of stroke, motivation and adherence at baseline and during study, mood at baseline or motivation of study personnel may be greater explanatory factors. Many differences were also visible in the interventions. Amount of study therapy in the intervention group, amount of study therapy in the control group and amount of conventional therapy were not retained in the meta-regression but the content in the different groups varied largely. In the dose-matched trials, for example, it was apparent that in the control group, an active control intervention such as conventional therapy or arm-hand training or a passive therapy such as cognitive training had been chosen. This difference might partly explain the heterogeneity. There was also a difference in the content of the intervention in the experimental group, although all approaches were considered trunk training; however, there was a difference in training intensity, meaning, more active or less active trunk training. For example, in the subgroup of selective-trunk training, participants in the trial of Lee 2017a only sat on a vibration plate without extra exercises and, in Karthikbabu 2018a, participants practised additional movements of the trunk on a large physio ball.

Publication bias or the failure to publish results of a study, is strongly suspected for the outcomes, activity of daily living, trunk function and standing balance. Publication bias can be caused by a number of factors (Dickersin 1993). This can be explained by not publishing the results, not starting the study, a lower inclusion rate than expected, a lack of interest from the study staff or editors, results that are negative, have no effect or do not match with previous studies, and authors who have a conflict of interest (Devito 2019). During the literature search for this review, there was a gap between the registered studies and the studies with a publication, where authors could be contacted, or authors who provided the unpublished results. Publication bias can have an impact on the inaccuracy of the pooled effect (Schmucker 2017). In this review, the grey literature has additionally been searched and the authors of trial registrations have been contacted. However, publication bias could be reduced in the future if authors report their results, regardless of publication or not, on the trials' registration forums. Journals should accept good, robust, high-quality studies regardless of the results. There could also be a forum where the unpublished results can be deposited (Devito 2019).

In spite of previous observations, the number of included studies are considerable. However, due to the limited sample size and limited strength of the evidence, the quality of the evidence for the main analysis (activities of daily living) and other secondary outcome parameters is very low to low.

Potential biases in the review process

We attempted to decrease the potential bias in the review by conducting a comprehensive search strategy in different databases and a hand search of bibliographies of the included trials, websites and grey literature. The search strategy was broad and detailed. However, it is still possible that some studies were not identified.

Two review authors independently assessed the quality of the studies and extracted data, with a third review author resolving disagreements to minimise bias.

We had to rule out four studies due to missing information and non-parametric outcomes. However, due to the large number of included studies and the small number of participants for which there was missing data (maximum 50 participants in total), it is unlikely that the outcome of these studies would alter the main results.

Another potential bias is that it was common that no change scores were provided in the published studies. We tried to lower the impact of those missing data by first contacting the authors for additional information, and sending a follow-up email to those who did not respond. However, only the minority of the contacted authors provided additional information.

Publication bias is possible due to trials that have not been published because of small sample sizes and negative results. We were able to rule out publication bias for the outcome measure, walking ability, by means of the funnel plot and Egger's test. Nonetheless, we see that the latter test did score significantly for a number of outcome parameters (activities of daily living, trunk function and standing balance).

Agreements and disagreements with other studies or reviews

As indicated in the introduction, some systematic reviews have already been published on this topic. When comparing the results, we noticed a number of relevant elements. First, the number of studies found and included in this review is notably higher, with a higher number of included participants. Moreover, besides adding more recent trials, this review identified older trials that were not identified in earlier reviews. This difference in numbers can partly be explained by a more extensive and comprehensive search strategy and terminology, because multiple scales per outcome of interest were chosen and the selection of trials was not limited to a specific outcome parameter such as only including trials that examined the effect on trunk function.

The first systematic review that was reported included 11 trials (317 participants) and described two types of therapy approaches; sitting training protocol and trunk exercises (Cabanas-Valdés 2013). No meta-analysis was performed, so a direct comparison with the results is difficult.

In the second systematic review, people after stroke received additional trunk training (non-dose-matched) in the experimental group, whereas participants in the control group received only conventional therapy, without any additional study therapy (Sorinola 2014). The effect was investigated by pooling two (53 participants) to five (135 participants) trials. No evidence of an effect of trunk training was observed for trunk function, standing balance and activities of daily living. A significant effect was only found for walking ability, based on three studies (65 participants). In this Cochrane Review, we replicated this latter result, albeit with a more robust analysis in terms of a larger number of trials (n = 11). Furthermore, we found that trunk training did have a positive effect on activities of daily living, trunk function, standing balance and walking ability. Besides the inclusion of more studies, this difference could be attributable to the fact that studies in Sorinola 2014 only included patients in the first three months after their stroke. Still, in our subgroup analysis for time after stroke, we again observed an effect of trunk training for the outcome parameters, activities of daily living, trunk function and standing balance.

A subsequent review evaluated the effect of additional therapy (non-dose-matched) on trunk function (Bank 2016). The authors concluded that additional therapy had an effect on the Trunk Impairment Scale, however, the authors also combined additional therapy with the focus on different starting positions such as standing or walking.

The review by Van Criekinge and colleagues included 22 studies and concluded that trunk training, as seen in this Cochrane Review, had a positive effect on trunk function, standing balance and mobility, however, with a relatively greater effect size (Van Criekinge 2019a). Results of trunk training were examined for specific outcomes by means of a subgroup analysis, albeit with a limited number of included trials. If we look at the outcome measures, a difference is noticeable. On the one hand, significant effects were still present for all results when looking at trunk function, standing balance and walking ability. On the other hand, this Cochrane Review included and pooled data of 39 additional trials. Heterogeneity was smaller in Van Criekinge's review because of a subgroup analysis performed with different scales, and because they applied a random-effects model analysis. Also, Van Criekinge 2019a chose not to include studies where additional electromechanical devices were used and where two types of trunk training were compared. We did observe this type of intervention and comparison in the literature and, therefore, chose to include these trials in this Cochrane Review.

In another recent review, the authors searched randomised controlled trials and included a total of 17 trials that used either trunk function or upper extremity function as the outcome measure (Alhwoaimel 2018). No studies were found that reported upper extremity function, which is different from the seven studies we found. Fourteen trials used the Trunk Impairment Scale as an outcome measure (449 participants), and a meta-analysis indicated an effect in favour of trunk training. Three trials measured trunk function using the Trunk Control Test (109 participants) with no evidence found when pooling that data. The overall effect of pooling studies reporting trunk function yielded a SMD of 0.85, with 95% CI 0.58 to 1.12. Our number of included trials as well as the effect size was higher. No studies were included in their review that were not included in this Cochrane Review, suggesting a comprehensive search strategy for our work. However, a difference in the inclusion criteria may explain the discrepancy in the number of studies found. In the review of Alhwoaimel 2018, trials were only included in which Trunk Impairment Scale, Trunk Control Test or upper extremity function was the outcome measure. We included other outcome parameters such as activities of daily living, walking ability and balance, and this may have resulted in an additional number of included trials, and a more comprehensive overview of the evidence.

The purpose of the most recent systematic review was to analyse the effect of trunk training on different outcome parameters (Souza 2019). For this, the authors pooled data from the Trunk Impairment Scale from seven studies (291 participants) and found an effect (MD 3.30, 95% CI 2.54 to 4.06) in favour of trunk training. Three trials were pooled to evaluate the effect of trunk training on the Berg Balance Scale (176 participants), also yielding a significant effect (MD = 13.17, 95% CI 9.49 to 16.84) in favour of trunk training. The overall effect found in the Souza 2019 was very large. Again, as in comparison with previous reviews, the pool of evidence identified in this Cochrane Review is larger, providing more confidence in the results found.

Two systematic reviews were found during the literature search where the choice was made to examine the effect of a specific therapy approach on different outcome measures. The purpose of the first systematic review was to investigate the effect of trunk training on an unstable surface (Van Criekinge 2018). The authors included seven trials and a significant difference was found for trunk function and walking ability, in favour of trunk training. Standing balance data were not pooled due to high heterogeneity. These results were confirmed in this Cochrane Review, where more studies were included. Moreover, the effect of unstable-trunk training is not only limited to trunk function and standing balance, but extends to activities of daily living, walking ability and the specific outcomes measured by the Trunk Impairment Scale and Berg Balance Scale.

The focus of a final systematic review was on core exercises (Cabrera-Martos 2020). The authors of that review defined core training as "any exercise that addresses motor control and muscular capacity of the core musculature". They included 14 trials, but did not limit the search to training that was conducted mainly in supine or seated position. In the analyses of this Cochrane Review, there is evidence of an effect of core-stability training on the Berg Balance Scale (MD 4.62, 95% CI 2.08 to 7.17, 3 trials, 119 participants) for the non-dose-matched comparison and on the Trunk Impairment Scale (MD 2.06, 95% CI 1.60 to 2.53, 7 trials, 256 participants) and Berg Balance Scale (MD 2.11, 95% CI 1.77 to 2.45, 5 trials, 308 participants) for the dose-matched comparison. The Cabrera-Martos and our review agree that core stability has a significant effect on the Trunk Impairment Scale but disagree on the effect of the Berg Balance Scale (MD 0.27, 95% CI -0.25 to 0.79, 6 trials, 247 participants). In this Cochrane Review, the search and analysis may have been carried out more extensively. Results were expanded to other measurement scales in our work. Moreover, we not only found a significant effect on the Trunk Impairment Scale and the Berg Balance Scale, but also on trunk function, standing balance, walking ability and leg function.

We can conclude that, compared to previous systematic reviews, we can draw largely similar conclusions or can conclude that a positive effect became apparent. This supports an overall effectiveness of trunk training after stroke. Due to a comprehensive and an extensive search, a high number of trials could be included and pooled. Furthermore, this review was not limited to a main analysis, but rather regarded trunk training from different perspectives with subsequent analyses. By this approach, clinically important questions can and hopefully have been answered.

AUTHORS' CONCLUSIONS

Implications for practice

Considerable evidence is available evaluating the effect of trunk training on different outcomes. Overall, after excluding trials with a high risk of bias, trunk training is beneficial for activities of daily living (very low-certainty evidence), trunk function (very low-certainty evidence), standing balance (very low-certainty evidence), and walking ability (moderate-certainty evidence). Less evidence is available for the other outcomes, suggesting a positive effect of trunk training on quality of life (low-certainty evidence), arm-hand function (low-certainty evidence) and leg function (very low-certainty evidence). Also, there is no evidence of an effect of trunk training on arm-hand activity (very low-certainty evidence).

The results of this review support the regular inclusion of trunk training in clinical practice when training people with stroke in the subacute phase, i.e. between two weeks and six months, as well as in the chronic phase, which means after six months.

Three trunk training therapy approaches were most studied in the literature. These are core-stability trunk training, selective-trunk training and unstable-trunk training. The number of included studies was limited, so caution with the clinical interpretation is necessary. In this analysis, there is evidence that core-stability trunk training improves trunk function, standing balance, leg function and walking ability. We see no beneficial effect on activities of daily living. Selective-trunk training may be beneficial for trunk function, standing balance and walking ability. Trunk training on an unstable surface might yield better outcomes for activities of daily living, trunk function, standing balance and walking ability. However, results are based on limited well-designed research so more well-designed, larger studies are needed to make strong recommendations for clinical practice.

Implications for research

There is a need for further well-designed and well-reported phase III randomised controlled trials, with a parallel-group design and a priori estimated sample size. Moreover, we see that no trials have been conducted in the acute phase. The design of the study must be set up and executed in such a way that the risk of bias is as small as possible and reproducibility is maximised for randomisation, allocation, selective reporting and blinding of assessors, participants and personnel. Authors should follow CONSORT guidelines for reporting results (Schulz 2010), and the TIDieR checklist to describe interventions (Hoffmann 2014), and enhance transparency. Adverse events and the effects of trunk training on activities of daily living are priority outcome measures, as is quality of life, including follow-up measurement. All authors should present change score values with standard deviations, values of baseline characteristics and provide an open access database. Details of trial training programmes should be incorporated in the report or made accessible (online). To minimise selective reporting and maximise transparency, studies should be registered before the start of the study.

Current evidence focuses on trunk training in the early subacute, late subacute and chronic phase in people with stroke. However, the median sample size of the included trials was 15 participants in each group. In this phase post stroke, there is still a need for well-designed phase III trials, adequately powered to give definitive

results in those phases. Because no trials were identified in the acute phase, no guidelines on the effect in that time post stroke could be made. Also, for these phases post stroke, well-designed and well-powered phase III trials are necessary. This review did not include and analyse follow-up data, accordingly, no results for long-term effects could be presented. The occurrence of adverse events is under-reported. In the trials where adverse events were reported, no long-term consequences were noted. Of course, the safety of people with stroke during training is a priority.

Finally, we see a great diversity of control interventions in the included studies. In subsequent studies, it is important to offer a dose-matched control intervention where the control intervention is an active intervention.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

An 2017

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to explore how additional trunk muscle training can be effective for mobility, balance, and trunk control of chronic stroke patients
Participants	**Baseline characteristics** Experimental training: • Mean age and SD: 59.73 ± 8.94 • Number of participants: 15 • Sex (men/women): 8/7 • Type of stroke event (H/I): 9/6 • Location of stroke event (R/L): 7/8 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 9.07 ± 3.47 Control group (same amount of additional therapy) • Mean age and SD: 57.07 ± 17.17 • Number of participants: 14 • Sex (men/women): 6/8 • Type of stroke event (H/I): 8/6 • Location of stroke event (R/L): 5/9 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 8.93 ± 2.30 **Inclusion criteria:** people with chronic stroke after 6 months of diagnosis, having a higher score than 24 in MMSE-K, being able to walk 10 metres independently, and scoring less than 21 on the TIS

An 2017 *(Continued)*

Exclusion criteria: people with scores higher than 21 on the TIS were excluded from this study as it indicates that they can perform everyday activities independently.

Pretreatment: there were no significant demographic differences between the groups.

Sample size calculation: the effect size was computed using the formula d = d/s (d) where d is the mean difference scores, and s(d) is the standard deviation of the difference scores. Effect size index was then defined using Cohen's classification of effect size index (d), where small d = 0.20, medium d = 0.50 and large d = 0.80. Hopkins (2000) suggests that a sample size of at least 30 individuals should be considered in reliability studies. In this case, the sample size was 31 using G*power software ver 3.1.9.2 (Kiel University, Germany) on effect size 0.85, alpha = 0.05, power = 0.95.

Interventions

Intervention characteristics

Experimental training

- Type of intervention: The intervention programmes of STE group was based on the protocols suggested by previous studies (Karthikbabu 2011). The exercise programme consisted of 4 supine exercises and 7 sitting exercises. The 4 supine exercises were lifting the pelvis with crook-lying, unilateral pelvic bridge, upper trunk flexion rotation, and lower trunk flexion rotation. The 7 sitting exercises were as follows: selective flexion extension of the lower trunk, upper trunk lateral flexion, lower trunk lateral flexion, upper trunk rotation, lower trunk rotation, forward reach, and lateral reach. The forward and lateral reaches were performed at shoulder height.
- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 3 sessions/week, 4 weeks, 30 minutes each session
- Total minutes of intervention: 360
- Total minutes of conventional therapy: 5 sessions/week, 4 weeks, 30 minutes each session = 600 minutes
- Content of standard care: conventional physical therapy based on neuro-development therapy using stretching exercise, strengthening of lower extremity muscle, progressive gait training, balance control, weight-shifting, bearing
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): the frequency of exercise was in accordance with the participants' physical performance capabilities. The exercise intensity was controlled by the reduction of the base support, an increase in lever arm to intensify the exercise load, and the changes in maintaining time. In addition, when the participants were training, they were supported to minimise compensatory movements. Warm-up and cool-down sessions were conducted for 2 minutes. There were 1 to 2 minute breaks during each exercise.
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts reported
- How well? (If intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: not reported
- Length of intervention in minutes, days, or weeks: not reported
- Total number of repetitions: not reported
- Total minutes of intervention: not reported
- Total minutes of conventional therapy: 5 sessions/week, 4 weeks, 30 minutes each session = 600 minutes
- Content of standard care: conventional physical therapy based on the neuro-development therapy using stretching exercise, strengthening of lower extremity muscle, progressive gait training, balance control, weight-shifting, bearing

An 2017 *(Continued)*

- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 1 patient in the control group was lost to follow-up at 3 weeks.
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes

Standing balance

- Outcome type: continuous outcome
- Scale: Berg Balance Scale
- Range: 0-56
- Direction: higher is better

Walking ability

- Outcome type: continuous outcome
- Scale: Timed Up and Go
- Range: not reported
- Direction: lower is better

Trunk function

- Outcome type: continuous outcome
- Scale: Trunk Impairment Scale 1.0
- Range: 0-23
- Direction: higher is better

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	The 28 participants with chronic stroke were observer-blinded, randomised through the block randomisation method, block size of 2 x 2.
Allocation concealment (selection bias)	Low risk	The method of allocation was concealed in sequentially-numbered, sealed envelopes. An independent observer who was not involved in interventions or the outcome measures performed the randomisation. Allocated into 2 groups: 19 participants were in the selective-trunk exercise (STE) group and 19 in the control group.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not reported
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Observer-blinded

An 2017 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Low risk	27 participants completed the study. 1 participant in the control group was lost to follow-up at 3 weeks. Reason for loss to follow-up was not reported.
Selective reporting (reporting bias)	High risk	No study registration. Almost all outcomes (except for TIS static) were significant in favour of the experimental group. Inconsistent reporting of the numbers recruited into the study and the numbers followed up, no CONSORT diagram
Other bias	Low risk	No other potential sources of bias found

Bae 2013

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to examine the changes in the cross-sectional area of the trunk muscles using CT and investigate how the trunk stabilisation exercise affects balance ability. This study also aimed to establish a scientific basis for an effective trunk muscle training environment for stroke patients.
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 52.4 ± 7.6 • Number of participants: 8 • Sex (men/women): 4/4 • Type of stroke event (H/I): 3/5 • Location of stroke event (R/L): 3/5 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 18.1 ± 4.2 Control group (same amount of additional therapy) • Mean age and SD: 53.4 ± 5.8 • Number of participants: 8 • Sex (men/women): 5/3 • Type of stroke event (H/I): 2/6 • Location of stroke event (R/L): 4/4 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 17.9 ± 4.3 **Inclusion criteria:** those who were diagnosed with an ischaemic or haemorrhagic stroke and whose onset of stroke was 6 months earlier or longer, who were able to sit independently for longer than 30 seconds, who did not have hemineglect, who were able to understand a therapist's direction and communicate, who were able to perform exercises for 30 minutes or longer, who did not have a medical contraindication against trunk exercise, who had no disease affecting balance, and who had no history of surgery due to musculoskeletal diseases were included in the study.

Bae 2013 *(Continued)*

Exclusion criteria: not reported

Pretreatment: no statistical test performed at baseline that evaluated group differences

Sample size calculation: no data available

Interventions	**Intervention characteristics** Experimental training • Type of intervention: trunk stabilisation exercises on an **unstable support surface**. All the participants in this study conducted task-specific movement exercises of the upper and lower trunk in the supine and sitting positions based on the revised and complemented version of Verheyde and colleagues (Verheyden 2004). • Length of intervention in minutes, days, or weeks: 12 weeks • Total number of repetitions: 30 minutes each session, 5 times a week • Total minutes of intervention: 1800 • Total minutes of conventional therapy: 5 times a week for 12 weeks • Content of standard care: not reported • Who provided study therapy: physical therapist • How provided (face-to-face, internet, telephone, individual, in group): face-to-face • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): when the trunk exercise was initiated, the therapist provided a moderate level of aid and gradually reduced the level of support. The number of exercise repetitions and the intensity were based on reducing the base of support, increasing the lever arm, advancing the balance limits, or increasing the hold time. • Modification (intervention was modified during the course of the study?): not reported • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts reported • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported • Material used: **physio ball** • Reporting of death and serious adverse events, including falls: not reported Control group (same amount of additional therapy) • Type of intervention: trunk stabilisation exercises on a **stable support surface**. All the participants in this study conducted task-specific movement exercises of the upper and lower trunk in the supine and sitting positions based on the revised and complemented version of Verheyden and colleagues (Verheyden 2004). • Length of intervention in minutes, days, or weeks: 12 weeks • Total number of repetitions: 30 minutes each session, 5 times a week • Total minutes of intervention: 1800 • Total minutes of conventional therapy: not reported • Content of standard care: not reported • Who provided study therapy: physical therapist • How provided (face-to-face, internet, telephone, individual, in group): face-to-face • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): when the trunk exercise was initiated, the therapist provided a moderate level of aid and gradually reduced the level of support. The number of exercise repetitions and the intensity were based on reducing the base of support, increasing the lever arm, advancing the balance limits, or increasing the hold time. • Modification (intervention was modified during the course of the study?): not reported • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts reported • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported

Bae 2013 *(Continued)*

- Material used: **therapy table**
- Reporting of death and serious adverse events, including falls: not reported

Outcomes	Trunk function • Outcome type: continuous outcome • Scale: TIS 2.0 • Range: 0-16 • Direction: higher is better • Data value: change from baseline
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Using white and black cards, this study assigned the participants equally to 2 experimental groups: group 1 performed trunk stabilisation exercises on a stable support surface, and group 2 performed trunk stabilisation exercises on an unstable support surface.
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not described in the study
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No details were available in the study.
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Judgement comment: no description of blinding of assessor
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No flow chart was available. The groups were the same size, but it could not be determined from the text whether 8 people per group was the goal or whether there were dropouts who were removed from the analysis.
Selective reporting (reporting bias)	Unclear risk	No study registration available, no P values reported; both significant and non-significant results were included in the trial.
Other bias	Low risk	No other potential sources of bias found

Bilek 2020

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to investigate the contribution of NMES to ES muscles, which is one of the important core muscles, in hemiparetic stroke patients on trunk control, mobility, balance, cognitive functions, and functional status. The results of this comprehensive study will have clinical importance in the planning of an ideal rehabilitation programme for the treatment of stroke patients.
Participants	**Baseline characteristics**

Bilek 2020 *(Continued)*

Experimental training

- Mean age and SD: 51.3 ± 3.7
- Number of participants: 30
- Sex (men/women): 13/17
- Type of stroke event (H/I): not reported
- Location of stroke event (R/L): 14/16
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: at least 3 months after CVD

Control group (same amount of additional therapy)

- Mean age and SD: 62.6 ± 2.2
- Number of participants: 30
- Sex (men/women): 16/14
- Type of stroke event (H/I): not reported
- Location of stroke event (R/L): 12/18
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: at least three months after CVD

Inclusion criteria: hemiplegia or hemiparesis due to the first history of CVD, at least 3 months after CVD, MMSE score ≥ 15

Exclusion criteria: people with ataxia, dystonia or dyskinesia; people with deep sensory disorders; people with a detection disorder and dementia; people with bilateral hemiplegia; people with implanted pacemakers or defibrillators

Pretreatment: there were no significant differences between the groups with respect to gender, median age, BMI, and affected side ratio (P > 0.05)

Sample size calculation: no data available

Interventions

Intervention Characteristics

Experimental training

- Type of intervention: NMES was delivered using a neuromuscular stimulator. Four electrodes were arranged over the thoracal and lumbar ES muscles bilaterally. The stimulation pulse was a symmetrical biphasic waveform with a pulse width of 400 milliseconds and frequency of 50 Hz. The intensity of electrical current was adjusted to the maximum level in which participants felt muscle contraction without pain or discomfort. In cases where contraction was reduced, the current was increased and contraction was obtained with the same quality, but not strong enough to spread to muscles other than the target muscles. These muscles were selected because they contribute significantly to the stability of the trunk during balance disruptions.
- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 5 sessions/week, 6 weeks, 20 minutes each session
- Total minutes of intervention: 600
- Total minutes of conventional therapy: 5 sessions/week, 6 weeks, 45 minutes each session = 1350 minutes
- Content of standard care: the conventional therapy programmes were patient-specific and consisted mainly of physiotherapy, such as neurodevelopmental facilitation techniques, passive mobilisation,

Bilek 2020 *(Continued)*

occupational therapy, postural control exercises, stretching, and range-of-motion exercises for the hemiparetic side and balance training.
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): in cases where contraction was reduced, the current was increased and contraction was obtained with the same quality, but not strong enough to spread to muscles other than the target muscles.
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): no
- Material used: neuromuscular stimulator device (Chattanooga Intelect Advanced therapy system, DJO, UK)
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: not reported
- Length of intervention in minutes, days, or weeks: not reported
- Total number of repetitions: not reported
- Total minutes of intervention: not reported
- Total minutes of conventional therapy: 1350
- Content of standard care: the conventional therapy programmes were patient-specific and consisted mainly of physiotherapy, such as neurodevelopmental facilitation techniques, passive mobilisation, occupational therapy, postural control exercises, stretching, and range-of-motion exercises for the hemiparetic side and balance training
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes

Standing balance

- Outcome type: continuous outcome
- Scale: Brunel Balance Assessment
- Range: not reported
- Direction: higher is better

Walking ability

- Outcome type: continuous outcome
- Scale: FAC
- Range: 0-5
- Direction: higher is better

Trunk function

- Outcome type: continuous outcome
- Scale: Postural Assessment Scale for Stroke

Bilek 2020 *(Continued)*

- Range: not reported
- Direction: higher is better

Quality of life

- Outcome type: continuous outcome
- Scale: Short Form-36
- Range: not reported
- Direction: higher is better

Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	A computer random allocation was used to randomly allocate the participants to a group.
Allocation concealment (selection bias)	Unclear risk	Not clearly described in the manuscript
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Quote: "Patients were blinded to the intervention". Personnel were not blinded.
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Evaluator was also blinded to all groups."
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No dropouts reported
Selective reporting (reporting bias)	Unclear risk	No study registration is available; all outcomes were positive.
Other bias	Low risk	No other potential sources of bias found

Büyükavcı 2016

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to compose an oriented circuit training programme with the aim of improving trunk balance in addition to conventional rehabilitation programme in stroke patients, and to assess the impact of these exercises on balance, functional condition, and ambulation
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 62.6 ± 10.5 • Number of participants: 33

Büyükavcı 2016 *(Continued)*

- Sex (women/men): 16/17
- Type of stroke event (I/H): 28/4
- Location of stroke event (L/R): not reported
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in days: 33.4 ± 11.4

Control group (no additional therapy)

- Mean age and SD: 63.6 ± 10.4
- Number of participants: 32
- Sex (women/men): 17/15
- Type of stroke event (I/H): 24/8
- Location of stroke event (L/R): not reported
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in days: 38.5 ± 19.9

Overall

- Comorbidity at baseline: 32.8% of the participants had no concomitant diseases associated with stroke, 17.2% had hypertension, 14.1% had diabetes mellitus and 29.7% had hypertension and diabetes mellitus. One participant had a history of transient ischaemic attack and two had ischaemic heart disease.

Inclusion criteria: hemiplegic patients for whom at least 3 weeks had passed since the usual time for admission following intracerebral infarction or haematoma

Exclusion criteria: determined as having a previous history of stroke, a present disease in the cerebellar system, dorsal column or vestibular system, lack of ability to understand instructions, presence of a major perceptual or cognitive disorder, serious visual defect, cardiorespiratory disease, neglect (determined by star cancellation test), lack of sitting balance, orthopaedic diseases hindering exercises in reaching position. People who scored grade 5 or 6 according to Brunnstrom staging were also excluded since they were in good functional condition. Perceptual and cognitive condition was evaluated with a mini-mental test, and people with a score of 16 and higher were included in the study.

Pretreatment: there was no difference between groups in terms of the participants' mean age, time since stroke, and gender distribution. As far as aetiology of stroke was concerned, thromboembolism became significant in both groups (77% in the control group and 86% in the intervention group). The dominant side was affected in 18 participants in the control group and 17 participants in the intervention group; there was no difference between the groups (P = 0.802).

Sample size calculation: scales were completed to evaluate 8 participants to determine the number of participants in the intervention group and a power analysis was made. Assuming a difference of 50%, 32 participants were included in each group for a significance level of P < 0.05.

Interventions	**Intervention characteristics** Experimental training • Type of intervention: repetitively pushed forward and caught a ball with a diameter of 10 cm which was hanging from the ceiling at the end of a cord. Nine different objects were placed on the table and participants covered these with other objects that they had to grasp. On a plate of 70 x 50 cm placed across from the participants, six different coloured markers with a diameter of 5 cm were arranged, and participants were asked to touch the object of the specified colour with their hands and similarly, touch the object of the specified colour on the plate placed in front of their feet with their foot. Per-

Büyükavcı 2016 *(Continued)*

formed computer-aided balance exercises (Nintendo Wii Fit-heading, table tilt, balance bubble). With the participant in sitting position, a pressure-sensitive balance platform was placed under both feet so that the platform contacted the feet. The participant played balance games by tilting with his/her trunk to the right and to the left and shifting his/her weight between positions.

- Length of intervention in minutes, days, or weeks: 3 weeks
- Total number of repetitions in the experimental and control group: 2 hours, 5 days/week, 3 weeks
- Total minutes of intervention: 900
- Total minutes of conventional therapy: 3000 minutes (2 to 3 hours per session each day for 5 days)
- Content of standard care: group neurodevelopmental facilitation techniques, occupational therapy
- Who provided study therapy: the study authors
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): no
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no
- How well? (If intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned: 1 participant dropped out because of femoral fracture on the 12th day.
- Material used: armless chair in front of a table
- Reporting of death and serious adverse events, including falls: not reported; one participant dropped out for femoral fracture.

Control group (no additional therapy)

- Type of intervention: none
- Length of intervention in minutes, days, or weeks: none
- Total number of repetitions in the experimental and control group: none
- Total minutes of intervention: none
- Total minutes of conventional therapy: 120 to 180 x 5 x 3 = 1800 to 2700
- Content of standard care: group neurodevelopmental facilitation techniques, occupational therapy
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (of intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned: not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: none reported

Outcomes

Trunk function

- Outcome type: continuous outcome
- Scale: TIS
- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Standing balance

- Outcome type: continuous outcome
- Scale: Berg Balance Scale
- Range: 0-56

Büyükavcı 2016 *(Continued)*

- Direction: higher is better
- Data value: change from baseline

Arm-hand activity

- Outcome type: continuous outcome
- Scale: Fugl Meyer-upper extremity
- Direction: higher is better
- Data value: change from baseline

Leg function

- Outcome type: continuous outcome
- Scale: Fugl Meyer-lower extremity
- Direction: higher is better
- Data value: change from baseline

Activities of daily living

- Outcome type: continuous outcome
- Scale: Functional Independence Measure-motor
- Direction: higher is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: After obtaining “written informed consent forms,” participants were randomised into two groups using the “Random Number Generator Program”.
Allocation concealment (selection bias)	Unclear risk	No description available in this trial
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Quote: "double-blinded randomized" Judgement comment: no description was made of blinding participant or personnel.
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Examinations were administered by an author who was blind to the treatment."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "One patient in the intervention group discontinued the study on the 12th day of admission due to femoral fracture and 32 patients completed the study ... "
Selective reporting (reporting bias)	Low risk	Judgement comment: significant and insignificant results were reported.
Other bias	Low risk	No other potential sources of bias found

Cabanas-Valdés 2016

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to investigate the effect of including additional core-stability exercises to conventional therapy on improving trunk performance and dynamic sitting balance. Additionally, this study aimed to determine whether core-stability exercises might also positively affect standing balance, gait, and activities of daily living in subacute post-stroke patients
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 74.92 ± 10.70 • Number of participants: 40 • Sex (women/men): 19/21 • Type of stroke event (I/H): 33/7 • Location of stroke event (L/R): 23/17 • Stroke severity at baseline, by means of the NIHSS or comparable scale: 9.42 ± 5.37 • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): 7 ± 2.8 • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in days: 25.12 ± 17.30 Control group (no additional therapy) • Mean age and SD: 75.69 ± 9.40 • Number of participants: 39 • Sex (women/men): 21/18 • Type of stroke event (I/H): 31/8 • Location of stroke event (L/R): 21/18 • Stroke severity at baseline, by means of the NIHSS or comparable scale: 8.54 ± 5.06 • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): 6 ± 0.34 • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in days: 21.37 ± 16.00 **Inclusion criteria:** all patients (age 18 years or older) who had experienced their first stroke, whether ischaemic or haemorrhagic (not requiring surgery), within the last 3 months were eligible for inclusion. The stroke diagnosis was based on the World Health Organization guidelines and was confirmed by clinical examination and magnetic resonance imaging. **Exclusion criteria:** included significant disability prior to stroke as evidenced by a score of > 3 on the modified Rankin scale, a Barthel Index score ≥ 75, and a Spanish version of Trunk Impairment Scale 2.0 score ≥ 10. Other exclusion criteria included orthopaedic or neurological impairments that could influence sitting balance, inability to understand instructions as assessed by a Mini Mental State Examination score ≤ 24, apraxia, and hemineglect. **Pretreatment:** no differences were found between the 2 groups for the collected demographic variables or stroke-related parameters. Comparisons between the groups at baseline also showed no difference for any physical outcome measures (P > 0.05), except for the stepping section of the Brunel Balance Assessment (gait) (P = 0.020). **Sample size calculation:** the number of participants required for this study was calculated taking into consideration the score variable "dynamic sitting balance subscale" on the Spanish version of the Trunk Impairment Scale 2.0. A standard deviation of 2.3 was assumed in both groups based on the results in the validation study for this scale performed prior to the trial. A type I error of 5% and a two tailed t-test with 80% power were also assumed. It was estimated that 37 participants would need to

Cabanas-Valdés 2016 *(Continued)*

	be included in each study arm in order to detect a 1.5-point improvement, yielding a total of 74 participants. To offset any possible dropouts estimated at < 10%, the final sample size was set at 80 participants.
Interventions	**Intervention characteristics** Experimental training • Type of intervention: Step 1: the exercises were performed in a supine position on a plinth or bed. When the participant was able to sit for 1 minute on the edge of the plinth or bed without any back or arm support with hips and knees bent at 90° and feet flat on the support surface, they moved on to step 2. Step 2: the exercises were performed in a sitting position on a stable surface. When the participant was able to sit on an unstable surface for 30 seconds, she/he moved on to step 3. Step 3: the exercises were performed in sitting position on a physio ball. • Length of intervention in minutes, days, or weeks: 5 weeks • Total number of repetitions: 5 weeks, 5 therapy sessions/week, 15 minutes of therapy each session • Total minutes of intervention: 375 • Total minutes of conventional therapy: 1500 • Content of standard care: patient-specific and consisted mainly of physiotherapy, such as tone facilitation, stretching, passive mobilisation, and range-of-motion exercises for the hemiparetic side, walking between parallel bars, and occupational therapy and nursing care. Additionally, activities of the trunk integrated in postural control and task-directed movement were performed. • Who provided study therapy: trained physiotherapist • How provided (face-to-face, internet, telephone, individual, in group): face-to-face, hands-on therapy • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): starting position depended on the ability of the participant. • Modification (intervention was modified during the course of the study?): not reported • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported • Material used: plinth, physio ball • Reporting of death and serious adverse events, including falls: not reported Control group (no additional therapy) • Type of intervention: no additional therapy • Length of intervention in minutes, days, or weeks: not reported • Total number of repetitions: not reported • Total minutes of intervention: not reported • Total minutes of conventional therapy: 1500 • Content of standard care: patient-specific and consisted mainly of physiotherapy, such as tone facilitation, stretching, passive mobilisation, and range-of-motion exercises for the hemiparetic side, walking between parallel bars, and occupational therapy and nursing care. Additionally, activities of the trunk integrated in postural control and task-directed movement were performed. • Who provided study therapy: trained physiotherapist • How provided (face-to-face, internet, telephone, individual, in group): face-to-face, hands-on therapy • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported • Modification (intervention was modified during the course of the study?): not reported • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported • Material used: not reported • Reporting of death and serious adverse events, including falls: not reported

Cabanas-Valdés 2016 *(Continued)*

Outcomes	Trunk function • Outcome type: continuous outcome • Scale: TIS • Direction: higher is better • Data value: change from baseline Standing balance • Outcome type: continuous outcome • Scale: Berg Balance Scale • Range: 0-56 • Direction: higher is better • Data value: change from baseline Activities of daily living • Outcome type: continuous outcome • Scale: Barthel Index • Direction: higher is better • Data value: change from baseline Walking ability • Outcome type: continuous outcome • Scale: Tinetti gait • Direction: higher is better • Data value: change from baseline
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Study participants were randomly allocated to either an experimental group or control group by means of a random computer-generated list specific to each centre. The randomization was managed by an external person uninvolved in the treatment or follow-up of patients."
Allocation concealment (selection bias)	Low risk	Quote: "The method of allocation was concealed in sequentially numbered, sealed, opaque envelopes."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No blinding mentioned
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "The principal investigator did not participate in the intervention but performed all of the clinical evaluations in a blinded manner."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Judgement comment: a flow chart was available. It indicated that there were no dropouts during the intervention.
Selective reporting (reporting bias)	Low risk	No registration available; however, both significant and insignificant results were reported.

Cabanas-Valdés 2016 *(Continued)*

Other bias	Low risk	No other potential sources of bias found

Cano-Mañas 2020

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to examine the effects of a protocol based on a commercial video game (VG) on balance, postural control, functionality, quality of life, and motivation outcomes in people with subacute stroke
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 60.35 ± 9.84 • Number of participants: 23 • Sex (women/men): 11/12 • Type of stroke event (I/H): 17/6 • Location of stroke event (L/R): 3/20 • Stroke severity at baseline, by means of the NIHSS or comparable scale: 13.17 ± 3.47 • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in days: 50.91 ± 18.44 Control group (no additional therapy) • Mean age and standard deviation: 65.68 ± 10.39 • Number of participants: 25 • Sex (women/men): 14/11 • Type of stroke event (I/H): 15/10 • Location of stroke event (L/R): 10/15 • stroke severity at baseline, by means of the NIHSS or comparable scale: 14.28 ± 4.13 • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in days: 54.52 ± 18.74 **Inclusion criteria:** people of both sexes diagnosed with ischaemic or haemorrhagic stroke confirmed by medical imaging, in the subacute phase, and aged between 18 and 80 years, with a score on the NIHSS below 20, a MoCA score equal to or above 14 (mild cognitive decline or absence of cognitive decline), a modified Rankin scale score between 0 and 4, participant able to maintain a standing position unassisted, and a score of ≥ 1 on the FAC **Exclusion criteria:** the presence of other visual, auditory, musculoskeletal, bone, or joint alterations in the acute or chronic phase that could influence the primary pathology; the presence of other neurological or cardiovascular illnesses which contraindicated physical exercise; people unable to maintain a sitting position unassisted; people who, at any time, displayed a worsening state of health due to another medical problem; people who displayed a contraindication for the use of video game devices and commercial video games, such as the presence of photosensitive epilepsy, or a score above 2 in the extremities on the modified Ashworth scale; and people who were unable to collaborate, with behavioural disorders, or rejecting treatment with video game-based systems **Pretreatment:** the variables of age, time of evolution post-stroke, NIHSS, and MoCA test followed a normal distribution. Statistically significant differences were observed between the groups for the vari-

Cano-Mañas 2020 *(Continued)*

ables on the affected side (P = 0.03) and the MoCA test (P = 0.01). The percentage of participants diagnosed with ischaemic stroke was 60% in the control group and 73.9% in the experimental group. Regarding the affected side of the body, the left side was affected in 60% of participants in the control group and 87% in the experimental group. Concerning the previous management of technological tools, 68% of participants in the control group were familiar with the use of technology, compared to 69.6% in the experimental group. No statistically significant differences were observed for the remaining variables administered prior to the intervention period, with the exception of pain/discomfort, anxiety/depression, and VAS for perceived health status.

Sample size calculation: the main outcome measure used to calculate the sample size was the modified Rankin scale. The G*Power 3.1.6 program was used for statistical analysis, considering that the estimated effect size for the main measure was 0.25. Considering a statistical power test of 0.95, an alpha error of 0.05, and a total of 2 measurements performed for the 2 groups, the estimated sample size required was 48 participants.

Interventions	**Intervention characteristics** Experimental training • Type of intervention: video game-based therapy with commercial video games using the Xbox 360° video games console and Kinect: Kinect Sports I® (aim: trunk control, first contact with video games, interaction with virtual reality), Kinect Sport II® (aim: reaching reactions, co-ordination, speed of reaction), Kinect Joy Ride® (co-ordination, reaction speed and reaching), and Kinect Adventures® (trunk control, co-ordination, reaction speed, weight transfer, balance and posture-holding) • Length of intervention in minutes, days, or weeks: 8 weeks • Total number of repetitions in the experimental and control group: 3 sessions/week for 8 weeks, 20 minutes per session • Total minutes of intervention: 480 • Total minutes of conventional therapy: 1680 • Content of standard care: physical therapy and occupational therapy • Who provided study therapy: 4 therapists • How provided (face-to-face, internet, telephone, individual, in group): not reported • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported • Modification (intervention was modified during the course of the study?): not reported • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): Scale of Satisfaction, Adherence, and Motivation was assessed; statistically significant differences were obtained for motivation (P < 0.01), self-esteem (P < 0.01), and adherence (P < 0.01). The percentage of assistance provided to participants from the experimental group was 95.28%, performing 526 interventions in a total of the 552 planned. • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): there were 5 dropouts (transferred to another hospital centre, medical discharge and worsening of the general status) • Material used: Xbox 360° video games console and the Kinect • Reporting of death and serious adverse events, including falls: no adverse event was registered derived from the treatment in any of the study groups Control group (no additional therapy) • Type of intervention: not reported • Length of intervention in minutes, days, or weeks: not reported • Total number of repetitions: not reported • Total minutes of intervention: not reported • Total minutes of conventional therapy: 1680 • Content of standard care: physical therapy and occupational therapy • Who provided study therapy: not reported • How provided (face-to-face, internet, telephone, individual, in group): not reported

Cano-Mañas 2020 *(Continued)*

- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): there were 3 dropouts (transfer to another hospital centre or discharge)
- Material used: not reported
- Reporting of death and serious adverse events, including falls: no adverse event was registered derived from the treatment in any of the study groups

Outcomes

Activities of daily living

- Outcome type: continuous outcome
- Scale: Barthel Index
- Range: 0-100
- Direction: higher is better
- Data value: change from baseline

Standing balance

- Outcome type: continuous outcome
- Scale: Tinetti balance
- Direction: higher is better
- Data value: change from baseline

Walking ability

- Outcome type: continuous outcome
- Scale: TUG
- Direction: lower is better
- Data value: change from baseline

Quality of life

- Outcome type: continuous outcome
- Scale: VAS
- Range: 0-100
- Data value: change from baseline

Visual Analogue Scale

- Outcome type: continuous outcome
- Range: 0-100
- Data value: endpoint

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "The participants were randomly distributed into two groups, using the QuickCalcs application by GraphPad Software ®: a control group (n = 28) and an experimental group (n = 28)."

Cano-Mañas 2020 *(Continued)*

Allocation concealment (selection bias)	Unclear risk	No description available in this trial
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No blinding mentioned for participants and personnel
Blinding of outcome assessment (detection bias) All outcomes	Low risk	All the assessments were performed with 2 evaluators who were blinded to the established study groups
Incomplete outcome data (attrition bias) All outcomes	Low risk	There were 3 dropouts in the control group (n = 25, 11%) and 5 dropouts in the experimental group (n = 23, 18%). This was due to a worsening of their general health status and was not related to the type of intervention performed and/or transfers to another hospital centre. Flow chart was available.
Selective reporting (reporting bias)	Low risk	Study registration was available; no reason to suggest reporting bias
Other bias	High risk	Judgement comment: difference between group at baseline for side of body affected and MoCA test

Chan 2015

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to compare the effectiveness of 3 treatment protocols—(1) TENS + TRTT, (2) placebo-TENS + TRTT, and (3) no active treatment — for people with chronic stroke
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 58.2 ± 10.7 • Number of participants: 12 • Sex (women/men): 4/8 • Type of stroke event (I/H): 9/3 • Location of stroke event (L/R): 5/7 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 43.9 ± 28.4 Selective-trunk training • Mean age and SD: 56.3 ± 7.4 • Number of participants: 13 • Sex (women/men): 3/10 • Type of stroke event (I/H): 10/3 • Location of stroke event (L/R): 5/8 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported

Chan 2015 *(Continued)*

- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 41.8 ± 28.7

Control group (no additional therapy)

- Mean age and SD: 59.3 ± 10.4
- Number of participants: 12
- Sex (women/men): 3/9
- Type of stroke event (I/H): 10/2
- Location of stroke event (L/R): 6/6
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 47.3 ± 29.8

Overall

- Mean age and SD: 57.8 ± 9.4
- Number of participants: 37
- Sex (women/men): 10/27
- Type of stroke event (I/H): 29/8
- Location of stroke event (L/R): 16/21
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 44.2 ± 28.3

Inclusion criteria: diagnosed with single stroke more than 6 months previously, had impaired sitting balance as indicated by a balance score of 3 to 5 out of 6 on the Motor Assessment Scale, had been discharged from all rehabilitation services for more than 3 months, and could get support by a caregiver for the home-based programme

Exclusion criteria: if they had medical comorbidities such as unstable blood pressure, used a cardiac pacemaker, had cognitive impairment indicated by scoring less than 7 out of 10 on the Abbreviated Mental Test, had unilateral neglect as indicated by a star cancellation test score or showed severe sensory deficits in the pin prick test.

Pretreatment: there were no significant differences among the 3 groups at baseline, including demographic data, mean isometric peak trunk flexion torque and extension torque, forward and lateral seated reaching distance, and TIS scores

Sample size calculation: the sample size was calculated using the Power Analysis and Sample Size software package (version 8 for Windows). An average effect size for the outcome measures of 0.59 was adopted on the basis of the meta-analysis. The estimated sample size for each group was 11. Four additional participants were recruited in anticipation of a dropout rate of 10% during the course of the study. The confidence level for statistical significance was set at 5% ($\alpha = 0.05$) with power equal to 80% ($\beta = 0.2$).

Interventions	**Intervention characteristics** Experimental training • Type of intervention: the components of the TRTT were grouped into 6 sets of exercises: (1) pelvic bridging, (2) sitting up, (3) trunk flexion and extension, (4) trunk lateral flexion, (5) trunk rotation, and (6) reaching (60 minutes). TENS: pairs of electrodes were placed on the skin over the latissimus dorsi

Chan 2015 *(Continued)*

(lateral to T9 over the muscle belly) and the external abdominus obliquus (aligned 45° to the vertical, 15 cm lateral to the umbilicus, anterior to the axillary line) on the affected side. High-frequency TENS (frequency 100 Hz; pulse width 0.2 ms) was used. The intensity of stimulation was set at twice the sensory threshold (the minimum intensity the participant could feel), which was barely below the motor threshold. The stimulation parameters were chosen based on the results of previous studies combining TENS with task-related training, which aimed at improving lower limb motor function after stroke.

- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 5 sessions a week/6 weeks/60 minutes per session
- Total minutes of intervention: 1800
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: physical therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face, 6 home visits and 6 telephone follow-ups
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: Model ITO 120Z dual channel TENS stimulator
- Reporting of death and serious adverse events, including falls: not reported

Selective-trunk training

- Type of intervention: the components of the TRTT were grouped into 6 sets of exercises: (1) pelvic bridging, (2) sitting up, (3) trunk flexion and extension, (4) trunk lateral flexion, (5) trunk rotation, and (6) reaching (60 minutes). The placebo stimulation: the electrical circuitry inside the TENS machine had been disconnected. An LED light blinked when the stimulator was switched on, but no electric current was delivered to the participant. The physical therapist told all participants before the intervention that "You might or might not feel any sensation or muscle contraction during the stimulation."
- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 5 sessions a week/6 weeks/60 minutes
- Total minutes of intervention: 1800
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: physical therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face, 6 home visits and 6 telephone follow-ups
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: Model ITO 120Z dual channel TENS stimulator
- Reporting of death and serious adverse events, including falls: not reported

Control group (no additional therapy)

- Type of intervention: the participants in the control group did not receive any active training except health education on measuring their blood pressure and monitoring the incidence of falls
- Length of intervention in minutes, days, or weeks: 6 weeks

Chan 2015 *(Continued)*

- Total number of repetitions: not reported
- Total minutes of intervention: not reported
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: physical therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face, 6 home visits and 6 telephone follow-ups
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes: Trunk function

- Outcome type: continuous outcome
- Scale: TIS
- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	No description available in this trial
Allocation concealment (selection bias)	Low risk	Quote: "After that baseline assessment, concealed randomization was conducted by a clerical worker who was not involved in the study."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No blinding mentioned
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Assessor-blinded
Incomplete outcome data (attrition bias) All outcomes	Low risk	5 participants of the total group of 47 withdrew in the intervention period. Reasons for dropout were provided. For the control group, dropout was due to schedule conflicts. Dropout in the intervention groups were not related to the intervention.
Selective reporting (reporting bias)	Low risk	Registration was available and no selective reporting could be detected.
Other bias	Low risk	No other potential sources of bias found

Chen 2020

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to evaluate the effects of rehabilitation training of core muscle stability on the balance function, ambulation ability, and abdominal muscle thickness of stroke patients with hemiplegia, aiming to provide valuable clinical evidence for their treatment
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 59.12 ± 12.67 • Number of participants: 90 • Sex (women/men): 33/57 • Type of stroke event (I/H): 54/36 • Location of stroke event (L/R): 39/51 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in days: 23.79 ± 2.45 Control group • Mean age and standard deviation: 59.05 ± 12.74 • Number of participants: 90 • Sex (women/men): 35/55 • Type of stroke event (I/H): 52/38 • Location of stroke event (L/R): 37/53 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in days: 24.06 ± 2.53 **Inclusion criteria:** (1) in accordance with the diagnostic criteria for stroke formulated at the 4th National Conference on the Diagnosis of Cerebrovascular Diseases, with confirmation by head CT or MRI; (2) first onset; (3) course within 6 months with stable conditions; (4) with ability to understand the instructions of researchers, and score of MMSE scale of ≥ 24 points; (5) with ability to maintain a standing position for over one minute with eyes open **Exclusion criteria:** (1) with serious heart, lung, liver, kidney and other diseases of vital organs, as well as unstable vital signs; (2) with other nervous system diseases causing balance dysfunction; (3) with severe orthopaedic diseases affecting standing; (4) with serious cognitive, speech, or vision disorder to be unable to complete the study; (5) underweight (BMI < 18.5) or overweight (BMI ≥ 24) **Pretreatment:** there were no significant differences in gender, age, BMI, duration of disease, as well as nature and site of lesions between the two groups (P > 0.05) **Sample size calculation:** N not calculated
Interventions	**Intervention characteristics** Experimental training

Chen 2020 *(Continued)*

- Type of intervention: core muscle training was performed using a multi-point multi-axis suspension training system. 1) the participant was placed in the supine position, the knee joints of the lower limbs were suspended with inelastic suspension straps, and the pelvis was raised to the horizontal position and maintained; 2) the participant was placed in the supine position, the waist was assisted by elastic suspension straps, and the lower extremity ankle joints were suspended with inelastic suspension straps, and the pelvis was raised to a horizontal position and maintained; 3) the participant was placed in the supine position, the waist was assisted by elastic suspension straps, and the affected lower extremity ankle joint were suspended with the inelastic suspension straps, and the pelvis was raised to a horizontal position and maintained; 4) the participant was placed in the lying position of the affected side, the waist was assisted by elastic suspension straps, the affected knee joint was suspended with inelastic suspension straps, the pelvis was raised to the horizontal position and maintained; 5) the participant was placed in a prone position, with the support of double elbows, the waist was assisted by elastic suspension straps, the knees and ankle joints were suspended with inelastic suspension straps, and the pelvis was raised to the horizontal position and maintained
- Length of intervention in minutes, days, or weeks: 8 weeks
- Total number of repetitions: 6 sessions/week, 8 weeks, 40 minutes each session
- Total minutes of intervention: 1440
- Total minutes of conventional therapy: 1440
- Content of standard care: routine rehabilitation training: 1) position of the non-affected limb; 2) physical therapy based on Bobath technology; 3) sitting position and standing balance training; 4) gait decomposition training; 5) daily life activity training
- Who provided study therapy: therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): the therapist gradually extended the maintenance time according to the participant's specific condition, with the maximum length not exceeding 3 minutes
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: multi-point multi-axis suspension training system
- Reporting of death and serious adverse events, including falls: not reported.

Control group

- Type of intervention: trunk control training: (1) roll-up training under supine position, bridge movement, sit-up training; (2) sitting-position trunk flexion and extension and rotation training; (3) resistance training of sitting-position trunk flexion and extension and rotation. All training was performed once a day, 40 minutes each time, six days per week for eight consecutive weeks
- Length of intervention in minutes, days, or weeks: 8 weeks
- Total number of repetitions: 1 session/day, 6 sessions/week, 8 weeks, 40 minutes each session
- Total minutes of intervention: 1440
- Total minutes of conventional therapy: 1440
- Content of standard care: routine rehabilitation training: (1) position of the non-affected limb; (2) physical therapy based on Bobath technology; (3) sitting position and standing balance training; (4) gait decomposition training; (5) daily life activity training
- Who provided study therapy: therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported

Chen 2020 *(Continued)*

	• Reporting of death and serious adverse events, including falls: not reported
Outcomes	Standing balance • Outcome type: continuous outcome • Scale: Brunel Balance Assessment • Range: 0-12 • Direction: higher is better • Data value: change from baseline Leg function • Outcome type: continuous outcome • Scale: Fugl-Meyer Assessment - lower extremity • Range: 0-34 • Direction: higher is better • Data value: change from baseline
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	The 180 included patients were randomly divided into an observation group and a control group (n = 90). There were no significant differences.
Allocation concealment (selection bias)	Unclear risk	The 180 included patients were randomly divided into an observation group and a control group (n = 90). No further details were described.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No blinding mentioned
Blinding of outcome assessment (detection bias) All outcomes	Low risk	All tests were conducted in a single-blinded manner, i.e. the operators were unaware of study grouping or treatment methods.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No data about participant dropout available
Selective reporting (reporting bias)	Unclear risk	No registration and no P values were available. Significant and non-significant outcomes reported
Other bias	Low risk	No other potential sources of bias found

Chitra 2015

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group

Chitra 2015 *(Continued)*

	Aim: to compare the effectiveness of core-stability exercises and pelvic PNF on balance, motor recovery, and function in people with hemiparesis
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 52.07 ± 5.98 • Number of participants: 15 • Sex (women/men): 2/13 • Type of stroke event (I/H): not reported • Location of stroke event (L/R): 9/6 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 1.20 ± 1.72 Control group (same amount of additional therapy) • Mean age and SD: 55.2 ± 8.25 • Number of participants: 15 • Sex (women/men): 3/12 • Type of stroke event (I/H): not reported • Location of stroke event (L/R): 11/4 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 2.67 ± 2.53 **Inclusion criteria:** diagnosed with the first unilateral stroke with onset less than 6 months prior, age between 45 and 70 years, able to ambulate 10 metres with or without walking aids, MMSE score greater than 24/30 **Exclusion criteria:** neurological disease affecting balance other than a stroke, such as cerebellar disease, Parkinson's disease and/or a vestibular lesion. Recent surgeries of abdomen and pelvis fracture less than 6 months prior, medically unstable, musculoskeletal disorders such as low backache, arthritis, or degenerative disease of the lower limbs affecting motor performance **Pretreatment:** no significant differences at baseline **Sample size calculation:** not reported
Interventions	**Intervention characteristics** Experimental training • Type of intervention: core stabilisation exercises where participants were taught to contract multifidus and transverse abdominis before commencement of exercise, which was expected to be in a contracted state during the exercise programme. The exercises included curl-ups with straight reaching, curl-ups with diagonal reaching, bridging, bridging with legs crossed, bridging with one leg, bird dog exercise and side bridging • Length of intervention in minutes, days, or weeks: 4 weeks • Total number of repetitions: 3 days/week for 4 weeks, 30 minutes • Total minutes of intervention: 360 • Total minutes of conventional therapy: 30

Chitra 2015 *(Continued)*

- Content of standard care: stretching and strengthening exercises for upper and lower extremities, techniques to normalise tone and weight-bearing exercises, active functional training for postural and functional control
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: pelvic PNF: 10 minutes each of rhythmic initiation, slow reversal, and agonistic reversals applied to the pelvic region. The procedures were done to facilitate anterior elevation and posterior depression of pelvic movement in a side-lying position which allows free motion of the pelvis. Elements of PNF, such as manual contact, stretch, resistance, and verbal cuing, were incorporated into the treatment sessions. Stretch was applied immediately and gently after the target muscle had been fully lengthened by relaxing the muscle before the participant started to move. For anterior elevation, the contralateral internal and external oblique abdominal muscle, and for posterior depression, internal and external oblique abdominal muscle were stretched.
- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 3 days/week for 4 weeks, 30 minutes
- Total minutes of intervention: 360
- Total minutes of conventional therapy: 30
- Content of standard care: stretching and strengthening exercises for upper and lower extremities, techniques to normalise tone and weight-bearing exercises, active functional training for postural and functional control
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes	Standing balance • Outcome type: continuous outcome • Scale: Berg Balance Scale • Range: 0-56 • Direction: higher is better • Data value: change from baseline Activities of daily living • Outcome type: continuous outcome • Scale: Functional Independence Measure-total • Range: 0-126

Chitra 2015 *(Continued)*

- Direction: higher is better
- Data value: change from baseline

Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Judgement comment: used the lottery method
Allocation concealment (selection bias)	Unclear risk	No description available in this trial
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants were briefed about the nature of the study.
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No description available in this trial
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No dropouts reported; no flow chart; not mentioned that all participants were tested post-intervention
Selective reporting (reporting bias)	Low risk	No significant differences between groups reported after intervention
Other bias	Low risk	No other potential sources of bias found

Choi 2014

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to investigate the effects of task-oriented training with whole body vibration (WBV) on the sitting balance of stroke patients.
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 62.8 ± 9.0 • Number of participants: 15 • Sex (women/men): 6/9 • Type of stroke event (I/H): not reported • Location of stroke event (L/R): 6/9 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported

Choi 2014 *(Continued)*

- Mean time and SD after stroke in months: 13.0 ± 5.4

Control group (same amount of additional therapy)

- Mean age and SD: 65.1 ± 15.7
- Number of participants: 15
- Sex (women/men): 8/7
- Type of stroke event (I/H): not reported
- Location of stroke event (L/R): 5/10
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 12.6 ± 5.7

Inclusion criteria: the inclusion criteria were history and clinical presentation (hemiparesis) of stroke (> 6 month post-event); ability to sit independently for at least 10 minutes; no participation in any balance training programme during the previous 6 months; no orthopaedic problems, such as a fracture, deformity, or severe osteoarthritis; and sufficient cognitive ability to participate in the training: MMSE-K scores of 21 or higher. Participation in the study was voluntary and the participants fully understood the contents of this study.

Exclusion criteria: the exclusion criteria were comorbidity or disability other than stroke, and an uncontrolled health condition for which vibration was contraindicated.

Pretreatment: there were no significant differences in gender, paretic side, age, weight, height, or duration of onset between the groups.

Sample size calculation: n/a

Interventions

Intervention characteristics

Experimental training

- Type of intervention: participants received WBV Galileo Pro (Novotec Medical GmbH, Germany) during task-oriented training in the sitting position. The WBV frequency (15 Hz to 22 Hz) and amplitude (0 mm to 5.8 mm) were adjusted relative to participants' physical abilities. The four exercise tasks were (1) sitting alone at a table and correcting body alignment; (2) reaching in different directions for objects located beyond arm's length using the non-paretic side; (3) reaching in different directions for objects located beyond arm's length using the paretic side; and (4) a bilateral reaching task, such as throwing a ball, lifting a box, and inserting a ring.
- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 15 minutes, 5 days/week, 4 weeks
- Total minutes of intervention: 300
- Total minutes of conventional therapy: not reported
- Content of standard care: conventional therapy
- Who provided study therapy: investigators
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): each exercise station was graded to each participants's level of functioning
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: vibration plate (Galileo Pro; Novotec MedicalGmbH, Germany)
- Reporting of death and serious adverse events, including fall: not reported

Choi 2014 *(Continued)*

	Control group (same amount of additional therapy) • Type of intervention: task-oriented training in the sitting position. The four exercise tasks were (1) sitting alone at a table and correcting body alignment; (2) reaching in different directions for objects located beyond arm's length using the non-paretic side; (3) reaching in different directions for objects located beyond arm's length using the paretic side; and (4) a bilateral reaching task, such as throwing a ball, lifting a box, and inserting a ring. • Length of intervention in minutes, days, or weeks: 4 weeks • Total number of repetitions: 15 minutes, 5 days/week, 4 weeks • Total minutes of intervention: 300 • Total minutes of conventional therapy: not reported • Content of standard care: conventional therapy • Who provided study therapy: investigators • How provided (face-to-face, internet, telephone, individual, in group): face-to-face • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): each exercise station was graded to each participants's level of functioning • Modification (intervention was modified during the course of the study?): not reported • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts reported • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported • Material used: not reported • Reporting of death and serious adverse events, including fall: not reported
Outcomes	Trunk function • Outcome type: continuous outcome • Scale: Modified Functional Reach Test-Anterior reach (cm) • Direction: higher is better • Data value: change from baseline
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "The participants were randomly assigned to the experimental group (n 1 = 15) or the control group (n 2 = 15)."
Allocation concealment (selection bias)	Unclear risk	No description available in this trial
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No blinding
Blinding of outcome assessment (detection bias) All outcomes	High risk	No blinding
Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants completed the intervention and the tests.

Choi 2014 *(Continued)*

Selective reporting (reporting bias)	High risk	No registration available and no P values were reported.
Other bias	Low risk	No other potential sources of bias found

Chung 2013

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to examine the effect of core stabilisation exercise on dynamic balance and gait functions in stroke patients
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 44.37 ± 9.90 • Number of participants: 8 • Sex (women/men): 3/5 • Type of stroke event (I/H): 6/2 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 12.88 ± 7.16 • Location of stroke event (L/R): 4/4 Control group (no additional therapy) • Mean age and SD: 48.38 ± 9.72 • Number of participants: 8 • Sex (women/men): 1/7 • Type of stroke event (I/H): 4/4 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 9.63 ± 4.86 • Location of stroke event (L/R): 3/5 **Inclusion criteria:** (1) independent gait ability with or without walking aid for a minimum of 15 m; (2) a MMSE score greater than 24/30; (3) adequate vision and hearing for completion of the study protocol, as indicated by the ability to follow written and oral instructions during screening; and (4) the capacity to understand and follow instructions **Exclusion criteria:** (1) a history of previous stroke or other neurologic diseases or disorders; (2) patients with pusher syndrome (defined as leaning to the hemiparetic side and giving resistance to any attempt at passive correction); (3) terminal illness; and (4) pain, limited motion, or weakness in the non-paretic lower extremity that affected performance of daily activities (by self-report) **Pretreatment:** no statistical test performed to evaluate the between group differences based on P values

Chung 2013 *(Continued)*

Sample size calculation: not reported

Interventions	**Intervention characteristics** Experimental training • Type of intervention: core stabilisation exercise group: 3 subparts, bed exercises, wedge exercises, and ball exercises using a Swiss ball. First, the bed exercises without devices consisted of bridge exercise, bridge exercise with legs crossed, bridge exercise with one leg, curl-ups with straight reaching, curl-ups with diagonal reaching, bird dog exercise, and side bridge exercise. Second, the wedge exercises consisted of curl-ups with straight reaching, curl-ups with diagonal reaching, and curl-ups with arms crossed. Finally, the ball exercises consisted of bridge exercise, bridge exercise to the side, bridge-ups, abdominal curl-ups, bird dog exercise, and push-ups. • Length of intervention in minutes, days, or weeks: 4 weeks • Total number of repetitions: 3 sessions/week, 4 weeks, 60 minutes/session • Total minutes of intervention: 720 • Total minutes of conventional therapy: 1200 • Content of standard care: general training programme (content not reported) • Who provided study therapy: not reported • How provided (face-to-face, internet, telephone, individual, in group): not reported • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported • Modification (intervention was modified during the course of the study?): not reported • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported • Material used: ball • Reporting of death and serious adverse events, including falls: not reported Control group (no additional therapy) • Type of intervention: not reported • Length of intervention in minutes, days, or weeks: not reported • Total number of repetitions: not reported • Total minutes of intervention: not reported • Total minutes of conventional therapy: 1200 • Content of standard care: general training programme (content not reported) • Who provided study therapy: not reported • How provided (face-to-face, internet, telephone, individual, in group): not reported • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported • Modification (intervention was modified during the course of the study?): not reported • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported • Material used: not reported • Reporting of death and serious adverse events, including falls: not reported
Outcomes	Walking ability • Outcome type: continuous outcome • Scale: TUG • Unit of measure: seconds • Direction: lower is better, change value is presented as an inverse value

Chung 2013 *(Continued)*

- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "The subjects were randomly divided into the core stabilization exercise group (eight subjects) and the control group (eight subjects)."
Allocation concealment (selection bias)	Unclear risk	No description available in this trial
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No blinding mentioned
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not described by the study authors
Incomplete outcome data (attrition bias) All outcomes	High risk	No flow chart; not reported whether all participants completed the entire study
Selective reporting (reporting bias)	Low risk	Quote: "No significant increase was observed in affected side step length (from 35.98 ± 12.95 cm to 41.54 ± 10.58 cm, P = 0.160) and stride length (from 69.51 ± 21.99 cm to 87.71 ± 18.89 cm, P = 0.075)."
Other bias	Low risk	No other potential sources of bias found

Chung 2014

Study characteristics

Methods

Study design: RCT
Study grouping: parallel group

Aim: to examine the feasibility of real-time feedback on postural stability and gait performance in people with chronic hemiparetic stroke during core stabilisation exercises. The hypothesis of this study was that core stabilisation exercises with real-time feedback can improve postural stability and gait performance.

Participants

Baseline characteristics

Experimental training

- Mean age and SD: 51.1 ± 9.2
- Number of participants: 9
- Sex (women/men): 5/5
- Type of stroke event (I/H): 4/6
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported

Chung 2014 *(Continued)*

- Comorbidity at baseline for diabetes (N): 2
- Comorbidity at baseline for hypertension (N): 9
- Mean time and SD after stroke in months: 9.2 ± 4.9
- Location of stroke event (L/R): 4/6

Control group (same amount of additional therapy

- Mean age and SD: 49.0 ± 9.2
- Number of participants: 10
- Sex (women/men): 2/7
- Type of stroke event (I/H): 4/5
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline for diabetes (N): 4
- Comorbidity at baseline for hypertension (N): 4
- Mean time and SD after stroke in months: 10.1 ± 4.7
- Location of stroke event (L/R): 3/6

Inclusion criteria: (1) more than six months after clinical diagnosis of ischaemic or haemorrhagic hemiparetic stroke; (2) sufficient cognitive ability to participate, as indicated by a MMSE score of 24 or higher; (3) independent gait ability with or without use of a walking aid for a minimum of 15 metres; (4) able to understand and follow verbal instructions, and (5) the ability to understand and follow instructions

Exclusion criteria: severe hemineglect, history or current diagnoses of other neurological diseases or musculoskeletal conditions, pain, limited motion, or weakness in the less affected lower extremity that affected the performance of daily activities (by self-report), and treatment for spasticity for up to three months (for botulinum toxin or baclofen injections)

Pretreatment: no significant differences between groups at baseline

Sample size calculation: not calculated

Interventions	**Intervention characteristics** Experimental training • Type of intervention: all participants performed core-stability exercises for improvement of balance and gait performance. The core-stability exercise consisted of three subparts, bed exercises, wedge exercises, and ball exercises using a Swiss ball. First, bed exercises without use of devices consisted of the following: bridge exercise, bridge exercise with the legs crossed, bridge exercise with one leg, curl-ups with straight reaching, curl-ups with diagonal reaching, bird dog exercise, and side bridge exercise. Second, the wedge exercises consisted of curl-ups with straight reaching, curl-ups with diagonal reaching, and curl-ups with arms crossed. Third, the ball exercises consisted of bridge exercise, bridge exercise to side direction, bridge up, abdominal curl up, bird dog exercise, and push-ups. In the experimental group, the participants put on a head-mounted device (HMD, SVGA resolution 800 × 600) (i-VisorFX601, Daeyang E&C Co, Seoul, Korea) in order to provide real-time feedback during performance of the core stabilisation exercise. The HMD was an augmented reality system that blends virtual movement with real movement in real-time (Birkfellner 2002). The augmented reality system provided guidance from virtual movement superimposed on the real movement in order to perform more normal activities during the core stabilisation exercise. Real movement was performed by participants themselves, and virtual movement was performed by a healthy young man (a physical therapist) performing the standard programme with the core stabilisation exercise. The participant watched the standard images showing movements performed by a healthy young man and then copied the movement using camera recognition technology. The participants were tracked and calibrated through a video approach during the exercise, and then modified their real movement with focused body parts based on the fiducial markers placed in the virtual movement. In order to provide an augmented real environment; this study used the camera recognition technique based on graphics and vision, the audiovisual expression technique for emotional biofeedback, the database of the au-

Chung 2014 *(Continued)*

diovisual model and cognitive information, and processing of motion behaviour depended on awareness of the participants' surroundings in the experimental group.

- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 3 sessions/week, 6 weeks, 30 minutes per session
- Total minutes of intervention: 540
- Total minutes of conventional therapy: 900
- Content of standard care: physical therapy
- Who provided study therapy: physical therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 3 participants dropped out before the post-test, due to a lack of participation and discharge from the hospital.
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: Swiss ball, head-mounted device (HMD, SVGA resolution 800 × 600) (i-Visor FX 601, Daeyang E&C Co, Seoul, Korea)
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: all participants performed core-stability exercises for improvement of balance and gait performance. The core-stability exercise consisted of three subparts: bed exercises, wedge exercises and ball exercises using Swiss ball. First, bed exercises without use of devices consisted of the following: bridge exercise, bridge exercise with the legs crossed, bridge exercise with one leg, curl-ups with straight reaching, curl-ups with diagonal reaching, bird dog exercise, and side bridge exercise. Second, the wedge exercises consisted of curl-ups with straight reaching, curl-ups with diagonal reaching, and curl-ups with arms crossed. Third, the ball exercises consisted of bridge exercise, bridge exercise to side direction, bridge up, abdominal curl-up, bird dog exercise, and push-ups.
- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 3 sessions/week, 6 weeks, 30 minutes per session
- Total minutes of intervention: 540
- Total minutes of conventional therapy: 900
- Content of standard care: physical therapy
- Who provided study therapy: physical therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 4 participants dropped out before the post-test, due to a lack of participation and discharge from the hospital.
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: Swiss ball
- Reporting of death and serious adverse events, including falls: not reported

Outcomes	Walking ability • Outcome type: continuous outcome • Unit of measure: TUG (sec) • Direction: lower is better • Data value: change from baseline

Chung 2014 *(Continued)*

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomly assigned to an experimental group, which met three times per week for 30 minutes for a period of six weeks, or a control group, which met three times per week for 30 minutes over the same period
Allocation concealment (selection bias)	High risk	No concealed allocation
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Nothing was described about blinding of participants or personnel.
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Measurements were performed by four physical therapists ... in order to exclude the influences of participant's knowledge of this study".
Incomplete outcome data (attrition bias) All outcomes	High risk	Seven participants dropped out before the post-test (three in the experimental group and four in the control group), due to a lack of participation and discharge from the hospital. The reasons for dropouts were described vaguely.
Selective reporting (reporting bias)	Low risk	No registration was available. Study reported significant and non-significant results.
Other bias	Unclear risk	No other potential sources of bias found

Dean 1997

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to examine the effect of a training programme designed to improve the ability to balance in sitting after stroke
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 68.2 ± 8.2 • Number of participants: 10 • Sex (women/men): 3/7 • Type of stroke event (I/H): not reported • Location of stroke event (L/R): 5/5 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in years: 6.7 ± 5.8

Dean 1997 *(Continued)*

Control group (same amount of additional therapy)

- Mean age and SD: 66.9 ± 5.9
- Number of participants: 10
- Sex (women/men): 3/7
- Type of stroke event (I/H): not reported
- Location of stroke event (L/R): 6/4
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in years: 5.9 ± 2.9

Inclusion criteria: (1) diagnosis of stroke resulting in hemiplegia at least 12 months ago; (2) discharge from all rehabilitation services; (3) ability to understand instructions; (4) ability to give informed consent; (5) no orthopaedic problem that would interfere with the ability to perform seated reaching tasks; and (6) ability to sit unsupported for a period of 20 minutes

Exclusion criteria: no participant had hemianopsia or any obvious cognitive or perceptual problems as evaluated with the MMSE score 25 and the Letter Cancellation Test.

Pretreatment: there were no significant differences between the groups in terms of age, time since stroke, or walking velocity (age, P = 0.717; time since stroke, P = 0.864; walking velocity, P = 0.248).

Sample size calculation: not reported

Interventions

Intervention characteristics

Experimental training

- Type of intervention: the training for the experimental group was designed to improve sitting balance and involved emphasis on appropriate loading of the affected leg while practising reaching tasks using the unaffected hand to grasp objects located beyond arm's length. The reaching tasks were performed under systematically varied conditions. Distance and direction were varied by changing the location of the object. Seat height, movement speed, object weight, and extent of thigh support on the seat were also varied. The training was advanced by increasing the number of repetitions and complexity of the tasks over the 2-week period.
- Length of intervention in minutes, days, or weeks: 2 weeks
- Total number of repetitions: 10 sessions over 2 weeks, 30 minutes
- Total minutes of intervention: 300
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: chair with arm and back supports, table
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: sham training that incorporated the performance of cognitive-manipulative tasks while seated at a table. Sham training was performed so that participants would consider them-

Dean 1997 *(Continued)*

selves involved in a training programme and to eliminate any effect due to placebo. Participants were seated in a chair with arm and back supports and the forearms resting on a table. They performed manipulative tasks using the unaffected hand over small distances (less than 50% of arm length). Training was advanced over sessions by increasing the repetitions and cognitive difficulty of the tasks. The participants in the control group performed an equal number of reaching movements as the participants assigned to the experimental group; however, the nature of the tasks ensured that only a minimum balance perturbation occurred.

- Length of intervention in minutes, days, or weeks: 2 weeks
- Total number of repetitions: 10 sessions over 2 weeks, 30 minutes
- Total minutes of intervention: 300
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: trainer
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): one participant (participant 17) from the control group dropped out of the study because of an acute neurological episode.
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: chair with arm and back supports, table
- Reporting of death and serious adverse events, including falls: not reported

Outcomes	Trunk function • Outcome type: continuous outcome • Scale: modified Forward Reach Test - seated (m) • Direction: higher is better • Data value: change from baseline
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Judgement comment: participants were randomly assigned to either the experimental or control group. Randomisation was blocked to ensure equal numbers in the groups. The procedure involved random sampling without replacement; participants drew a card from a box that was originally filled with 10 control and 10 experimental cards.
Allocation concealment (selection bias)	High risk	Judgement comment: randomisation was blocked to ensure equal numbers in the groups.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Judgement comment: the control group had sham training that incorporated the performance of cognitive-manipulative tasks while seated at a table. Sham training was performed so that subjects would consider themselves involved in a training programme and to eliminate any effect due to placebo. Study personnel was not blinded.
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Judgement comment: walking speed and cognitive-manipulative tasks were evaluated by an assessor blinded to the participant's group allocation. Biomechanical data collection and analysis for the seated reaching tasks and sit-to-

Dean 1997 *(Continued)*

		stand were computerised, which minimised experimenter bias because group allocation was not evident to the operator.
Incomplete outcome data (attrition bias) All outcomes	Low risk	Judgement comment: one participant (participant 17) from the control group dropped out of the study because of an acute neurological episode that required hospitalisation.
Selective reporting (reporting bias)	High risk	Judgement comment: walking speed and level of independence were not given after intervention.
Other bias	Low risk	No other potential sources of bias found

Dean 2007

Study characteristics	
Methods	**Study design:** randomised controlled trial **Study grouping:** parallel group **Aim:** the research questions for this study were: in individuals within three months of a stroke who are able to sit unsupported: 1. does completion of a 2-week sitting training protocol improve sitting ability (maximum reach distance) and sitting quality (reaching performance)? 2. does completion of a 2-week sitting training protocol have carry-over benefits to standing up and walking? 3. are any gains maintained six months after the cessation of training?
Participants	**Baseline Characteristics** Experimental training • *Mean age and standard deviation*: 60 ± 7 • *Number of participants*: 6 • *Sex (Female/Male)*: 1/5 • *Type of stroke event (I/H)*: not reported • *Location of stroke event (L/R)*: 3/3 • *Stroke severity at baseline, by means of the National Institutes of Health Stroke Scale (NIHSS) or comparable scale*: not reported • *Hyper-acute treatment of stroke (i.e. thrombolytic therapy)*: not reported' • *Presence of other stroke-related impairments*: not reported • *Comorbidity at baseline*: not reported • *Mean time and SD after stroke in days*: 21 ± 8 Control group (same amount of additional therapy) • *Mean age and standard deviation*: 74 ± 12 • *Number of participants*: 6 • *Sex (Female/male)*: 2/4 • *Type of stroke event (I/H)*: • *Location of stroke event (L/R)*: 5/1 • *Stroke severity at baseline, by means of the National Institutes of Health Stroke Scale (NIHSS) or comparable scale*: not reported

Dean 2007 *(Continued)*

- *Hyper-acute treatment of stroke (i.e. thrombolytic therapy)*: not reported
- *Presence of other stroke-related impairments*: not reported
- *Comorbidity at baseline*: not reported
- *Mean time and SD after stroke in days*: 37 ± 23

Inclusion criteria: people were included if they had: (1) a diagnosis of first stroke resulting in hemiplegia within the previous three months; (2) no orthopaedic problems which would interfere with the ability to perform seated reaching tasks; (3) no visual problems which would interfere with reaching to pick up objects or reading; (4) a score of at least 3 on Item 3 (sitting balance) of the Motor Assessment Scale for Stroke; (5) the ability to reach with intact arm a distance equivalent to 140% of arm's length; (6) no major cognitive or perceptual problems identified using the short portable mental status questionnaire; (7) no left neglect identified using the Letter Cancellation Test; (8) the ability to give informed consent; and (9) the ability to understand instructions.

Exclusion criteria: not reported

Pretreatment: not calculated

Sample size calculation: not available

Interventions

Intervention Characteristics

Experimental training

- *Type of intervention*: improve sitting by reaching beyond arm's length using the unaffected hand whilst focusing on: (1) smooth co-ordinated motion of the trunk and arm to get the hand to the object; (2) appropriate loading of the affected foot; and (3) preventing the use of maladaptive strategies such as widening the base of support. While reaching beyond arm's length, reach distance, direction, thigh support, seat height, and task were varied systematically. Training was progressed over the 2-week period by increasing the reach distance and the number of repetitions.
- *Length of intervention in minutes, days, or weeks*: 2 weeks
- *Total number of repetitions*: 10 sessions/2 weeks
- *Total minutes of intervention*: 300
- *Total minutes of conventional therapy*: not reported
- *Content of standard care*: all regular physiotherapy intervention other than training to improve sitting
- *Who provided study therapy*: therapist
- *How provided (*face-to-face*, internet, telephone, individual, in group)*: face-to-face
- *Tailoring (If the intervention was* intended *to be personalised, titrated or adapted? What and how?)*: not reported
- *Modification (intervention was modified during the course of the study?)*: not reported
- *How well (If intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?)*: not reported
- *How well? (If intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned)*: not reported
- *Material used*: Table, some functional objects
- *Reporting of death and serious adverse events, including falls*: one adverse event. One participant from the experimental group slipped from the stool while training. The participant then completed the training session and continued with all other sessions.

Control group (same amount of additional therapy)

- *Type of intervention*: sham sitting training protocol. This training involved participants completing a series of 11 cognitive-manipulative tasks. Participants were seated at a table, well supported in a chair with back and armrests, with their forearms resting on the table. The workspace was confined so that reach distance was less than 50% of arm's length which minimised perturbations to balance.
- *Length of intervention in minutes, days, or weeks*: 2 weeks
- *Total number of repetitions*: 10 sessions/2 weeks
- *Total minutes of intervention*: 300
- *Total minutes of conventional therapy*:

Dean 2007 *(Continued)*

- *Content of standard care*: all regular physiotherapy intervention other than training to improve sitting
- *Who provided study therapy*: not reported
- *How provided (*face-to-face*, internet, telephone, individual, in group)*:
- *Tailoring (If the intervention was* intended *to be personalised, titrated or adapted? What and how?)*: not reported
- *Modification (intervention was modified during the course of the study?)*: not reported
- *How well (If intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?)*: not reported
- *How well? (If intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned)*: not reported
- *Material used*: not reported
- *Reporting of death and serious adverse events, including falls*: no adverse events in the control group

Outcomes

Trunk function

- **Outcome type**: continuous outcome
- **Scale**: modified Forward Reach test - seated (m)
- **Unit of measure**: m
- **Direction**: higher is better
- **Data value**: change from baseline

Walking ability

- **Outcome type**: continuous outcome
- **Scale**: 10-Meter Walk Test (m/s)
- **Unit of measure**: m/s
- **Direction**: higher is better
- **Data value**: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Randomisation was concealed from the recruiter and assessor by using sealed opaque envelopes containing the allocation, which was generated earlier by a person independent of the study using random number tables, blocked to ensure equal numbers of experimental and control participants." The size of the blocks were unknown so it was impossible to perform a future randomisation in the exact same way.
Allocation concealment (selection bias)	Low risk	Quote: "Randomisation was concealed from the recruiter and assessor by using sealed opaque envelopes containing the allocation, which was generated earlier by a person independent of the study using random number tables, blocked to ensure equal numbers of experimental and control participants."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Quote: "Participants in the control group completed a sham sitting training protocol designed to improve attention (Dean 1997). Sham training was performed so that participants would consider themselves involved in a training programme, which would eliminate any effect due to placebo." However, it was unclear how the personnel was blinded.
Blinding of outcome assessment (detection bias) All outcomes	Low risk	The third author remained blinded to group allocation and collected the outcomes measures post-training and six months later. The collection of some outcome measures required two persons, one of whom was not blinded. To re-

Dean 2007 *(Continued)*

		duce bias, the blinded assessor (third author) gave all instructions and measured outcomes which were not collected by the computer.
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "Reasons for loss to follow-up were: 1 refusal (experimental), 1 death (control), and 1 no longer residing at address and unable to be contacted (control)." Quote: "All 12 participants received intervention as allocated and completed post testing."
Selective reporting (reporting bias)	High risk	Judgement comment: no P values reported
Other bias	Low risk	No other potential sources of bias found

DeLuca 2020

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Why:** to evaluate the effectiveness of a robot-based trunk and balance training in improving the recovery in chronic stroke patients compared to a traditional physical therapy programme
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 58.53 ± 1.87 • Number of participants: 15 • Sex (women/men): 9/6 • Type of stroke event (I/H): 10/5 • Location of stroke event (L/R): 7/8 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Time after stroke: more than 6 months Control group (same amount of additional therapy) • Mean age and SD: 63.46 ± 2.51 • Number of participants: 15 • Sex (women/men): 5/10 • Type of stroke event (I/H): 11/4 • Location of stroke event (L/R): 9/6 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Time after stroke: more than 6 months **Inclusion criteria:** age between 18 and 75 years; unilateral stroke detected by magnetic resonance; chronic stroke (more than 6 months after the disease onset); Berg Balance Scale ≥ 41/56; ability to walk

DeLuca 2020 *(Continued)*

for at least 10 metres; intact cognitive status (MMSE > 26/30 or Token Test > 26 for patients with aphasia)

Exclusion criteria: participants with visual, vestibular, orthopaedic or other neurological diseases were excluded from the study.

Pretreatment: there were no significant differences between groups regarding demographic data, side of hemiparesis, stroke aetiology, or outcome measures at T0.

Sample size calculation: not reported

Interventions

Intervention characteristics

Experimental training

- Type of intervention: robot-assisted rehabilitative exercises, training was focused on three components of balance: steady state, proactive balance, reactive balance. For each of these components, focused activities were performed for both groups. In detail, steady state activities were focused on posture maintenance in sitting or standing position with static or unstable platform and seat. Proactive balance activities included: upper limbs motor tasks while maintaining balance on a static or unstable platform/seat; execution of task in asymmetric two legs or one leg load; head and trunk rotations; reaching movements and limits of stability. Reactive balance activities included postural adaptation following perturbation exercises, and upper limb tasks with an unstable seat/platform. Exercises executed on the robotic device included a graphic interface with visual and audio feedback of the participant's performance during the task (load on the platform/seat, angular displacement of the platform/seat, trunk position in sagittal and frontal plane).
- Length of intervention in minutes, days, or weeks: 5 weeks
- Total number of repetitions: 3 times/week for 5 weeks, 45 minutes = 15 sessions
- Total minutes of intervention: 675
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: physical therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring iIf the intervention was intended to be personalised, titrated or adapted? What and how?): exercise parameters were set in line with each participant's impairment and their performance during training, in order to match their specific needs and to provide a training proportional to their capabilities, but also sufficiently challenging (i.e. neither too easy nor too difficult)
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 1 dropout
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): showed a good satisfaction about the rehabilitative training performed. Satisfaction score for the experimental group was greater, despite the group difference not reaching statistical significance (mean VAS at test moment 1, experimental group: 9.57 ± 0.20 SE; control group: 8.92 ± 0.30 SE)
- Material used: Hunova (Movendo Technology srl, Genoa, IT)
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: traditional rehabilitative programme with physical therapists using common rehabilitation instruments
- Length of intervention in minutes, days, or weeks: 5 weeks
- Total number of repetitions: 3 times/week for 5 weeks, 45 minutes = 15 sessions
- Total minutes of intervention: 675
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: physical therapist.

DeLuca 2020 *(Continued)*

- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): exercise parameters were set in line with each participant's impairment and their performance during training, in order to match their specific needs and to provide a training proportional to their capabilities, but also sufficiently challenging (i.e. neither too easy nor too difficult)
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 2 dropouts
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes

Trunk function

- Outcome type: continuous outcome
- Scale: TIS 1.0
- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Standing balance

- Outcome type: continuous outcome
- Scale: Berg Balance Scale
- Range: 0-56
- Direction: higher is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	No description available in this trial
Allocation concealment (selection bias)	Unclear risk	Judgement comment: no information was available.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No description of blinding of participants or personnel available in this trial
Blinding of outcome assessment (detection bias) All outcomes	Low risk	An expert clinician blind to the experiment evaluated the participants.
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "Dropout rate and reasons were similar for the two groups: a total of three subjects (1 from the experimental and 2 from the control group) dropped out of the study due to a change in their clinical/functional conditions [two subjects dropped out after the T0 evaluation, while one subject, part of the control group, did not complete the follow-up assessment (T2)]; therefore, 27 out of 30 subjects performed the whole experiment."

DeLuca 2020 *(Continued)*

Selective reporting (reporting bias)	Low risk	Judgement comment: statistical and non-statistical results were presented.
Other bias	Low risk	Judgement comment: approximately an equal number of participants dropped out; no significant differences at baseline, similar treatment

De Sèze 2001

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to compare the Bon Saint Côme device with conventional methods of rehabilitation regarding efficacy in restoring postural control in hemiplegic patients
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 63.5 ± 17 • Number of participants: 10 • Sex (women/men): 5/5 • Type of stroke event (I/H): 3/7 • Location of stroke event (L/R): 1/9 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in days: 36.8 ± 25 Control group (same amount of additional therapy) • Mean age and SD: 67.7 ± 15 • Number of participants: 10 • Sex (women/men): 4/6 • Type of stroke event (I/H): 4/6 • Location of stroke event (L/R): 6/4 • Stroke severity at baseline, by means of the NIHS) or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in days: 27.7 ± 15 **Inclusion criteria:** hemiplegia caused by a single supratentorial ischaemic or haemorrhagic stroke that had occurred at least 1 month previously, and static imbalance of the trunk resulting from the stroke. Static imbalance was defined as a score less than or equal to 2 on the sitting and upright equilibrium indexes ... i.e. sitting postural imbalance in the presence of a destabilising force and incomplete shift of weight-bearing to the hemiplegic leg in upright standing. **Exclusion criteria:** multiple or infratentorial cerebral lesions, disorders of the locomotor system, a severe visual or auditory deficit, a severe deficit of the executive functions, or a deterioration in the general state of health that might alter postural performances **Pretreatment:** there were no statistically significant differences between the DG and CG for any of the studied parameters and demographic characteristics.

De Sèze 2001 *(Continued)*

	Sample size calculation: not calculated
Interventions	**Intervention characteristics** Experimental training • Type of intervention: the patient performs exercises of locating and pointing out targets by controlling movements of the trunk. If these conditions are heeded, extension, forward motion of translation, and axial rotation are necessary to explore the panels and touch the targets. • Length of intervention in minutes, days, or weeks: 4 weeks • Total number of repetitions: 5 sessions/week for 4 weeks, 60 minutes/session • Total minutes of intervention: 1200 • Total minutes of conventional therapy: 2400 • Content of standard care: 1 hour of conventional therapy + occupational therapy (Bobath-inspired approach and functional therapy) • Who provided study therapy: physical therapist • How provided (face-to-face, internet, telephone, individual, in group): face-to-face • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): the therapist intervenes constantly to correct the orientation and stabilisation of the trunk and to help the patient develop awareness of the postural deficit. The complexity of the tasks is increased gradually (reduction of cueing intensity, horizontal then vertical and diagonal exploration, alternation in rhythm and sensorial modality involved) and adapted to each patient according to his/her capacities of attention, intention, and motor execution. Exercises are initially performed in the sitting position. After the physiotherapist judges that the patient has adequate control of the trunk in a sitting position, the patient is asked to perform the same exercises in a standing position. • Modification (intervention was modified during the course of the study?): not reported • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): all the patients completed the study. • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported • Material used: Bon Saint Côme device • Reporting of death and serious adverse events, including falls: none had adverse effects. Control group (same amount of additional therapy) • Type of intervention: additional extra hour of conventional therapy • Length of intervention in minutes, days, or weeks: 4 weeks • Total number of repetitions: 5 sessions/week for 4 weeks, 60 minutes/session • Total minutes of intervention: 1200 • Total minutes of conventional therapy: 2400 • Content of standard care: 1 hour of conventional therapy + occupational therapy (Bobath-inspired approach and functional therapy) • Who provided study therapy: physical therapist • How provided (face-to-face, internet, telephone, individual, in group): face-to-face • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported • Modification (intervention was modified during the course of the study?): not reported • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): all the patients completed the study. • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported • Material used: not reported • Reporting of death and serious adverse events, including falls: none had adverse effects.
Outcomes	Trunk function • Outcome type: continuous outcome

De Sèze 2001 *(Continued)*

- Scale: Trunk Control Test
- Range: 0-100
- Direction: higher is better
- Data value: change from baseline

Walking ability

- Outcome type: continuous outcome
- Scale: FAC
- Range: 0-5
- Direction: higher is better
- Data value: change from baseline

Activities of daily living

- Outcome type: continuous outcome
- Scale: Functional Independence Measure-total
- Range: 0-126
- Direction: higher is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "The patients were distributed consecutively into 2 groups of 10 each by using a randomization table."
Allocation concealment (selection bias)	Unclear risk	Quote: "The patients were distributed consecutively into 2 groups of 10 each by using a randomization table."
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: only blinding of outcome assessor
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "The study was conducted in a blinded fashion: the clinician who evaluated the patients did not know to which group they belonged."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "All the patients completed the study and none had adverse effects."
Selective reporting (reporting bias)	Low risk	Judgement comment: significant and insignificant results were presented.
Other bias	Low risk	No other potential sources of bias found

Dubey 2018

Study characteristics

Methods	**Study design:** RCT

Dubey 2018 *(Continued)*

Study grouping: parallel group
Aim: to examine the effects of pelvic stability training, that is, the dynamic co-activity and strengthening of lower trunk and proximal hip muscles on trunk and lower extremity movement control, hip muscles strength, walking speed and daily functioning in patients with stroke

Participants	**Baseline characteristics** Experimental training • Mean age and SD: 54.35 ± 11.64 • Number of participants: 17 • Sex (women/men): 4/13 • Type of stroke event (I/H): 13/4 • Location of stroke event (L/R): 11/6 • Stroke severity at baseline, by means of the Barthel index: 64.41 ± 18.69 • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: 9 patients (53%) in the pelvic stability training group and 10 patients (59%) in the standard physiotherapy group allegedly reported alcohol consumption. Among 34 participants, most of them, 13 patients in each group (76%) had a previous history of either diabetes mellitus or hypertension or both. The medical report showed that there was an associated cardiac illness in 5 (29%) and 7 (41%) patients from experimental and control groups, respectively. • Mean time and SD after stroke in days: 240 ± 135 Control group (same amount of additional therapy) • Mean age and SD: 58.24 ± 11.77 • Number of participants: 17 • Sex (women/men): 5/12 • Type of stroke event (I/H): 13/4 • Location of stroke event (L/R): 13/4 • Stroke severity at baseline, by means of the Barthel index: 64.76 ± 19.00 • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: 9 patients (53%) in pelvic stability training group and 10 patients (59%) in standard physiotherapy group allegedly reported alcohol consumption. Among 34 participants, most of them, 13 patients in each group (76%) had a previous history of either diabetes mellitus or hypertension or both. The medical report showed that there was an associated cardiac illness in 5 (29%) and 7 (41%) patients from experimental and control groups, respectively. • Mean time and SD after stroke in days: 199 ± 176 **Inclusion criteria:** patients with first episode of either haemorrhagic or ischaemic stroke, ability to understand simple verbal commands, standing ability with or without manual assistance/mobility aids, Brunnstrom stage beyond 3 for lower limb motor recovery were recruited in the study. **Exclusion criteria:** any other neurological and musculoskeletal dysfunction such as cerebellar lesion, perceptual dysfunction and any history of lower limb or pelvic fractures in the previous 6 months that might potentially affect their performance of balance and walking **Pretreatment:** at baseline, the demographic characteristics and outcome variables were similar except FMA-LE (P = 0.008) and TIS 2.0 (P = 0.001) **Sample size calculation:** not calculated
Interventions	**Intervention characteristics** Experimental training

Dubey 2018 *(Continued)*

- Type of intervention: exercises such as pelvic bridge, unilateral bridging and pelvic rotations in supine positions emphasised the lower trunk abdominals and proximal hip muscular co-activity, particularly the gluteus medius and maximus. These exercises were initially given in plinth and later on using physio ball. The gluteus medius was activated when the patient was lying on the most involved side with both hips and knees flexed to 90°. The patient was instructed to abduct the top hip against the manual resistance applied at the distal thigh by the therapist. Irradiation from hip abductors of the strong leg was made to overflow to the weak gluteus medius muscle. From the same starting position, the patient was guided to lift both knees towards ceiling and was instructed to hold them for 5–10 s. This might reinforce the activity of lower abdominals along with ipsilateral hip abductors and contralateral hip adductors. Tri-phasic burst of hip extensor and flexor muscle groups was activated when the patient was lying on his least involved side. Hip extensors and flexors being the tonic and phasic muscles, respectively, the extensor was activated isometrically at an inner range, that is, extreme hip extension and flexor were contacted isotonically from an outer to an inner range, that is, towards maximum hip flexion. While sitting on an unstable support such as therapads, the pelvic muscular co-activity was enhanced using dynamic weight shifts between buttocks. During anterior-posterior weight shifts, the forward trunk inclination with anterior pelvic tilt was encouraged to activate the gluteus maximus and the lower trunk abdominals. The pelvic stability in walk standing and step standing positions was achieved by dynamic weight shifts through tactile cueing of lower trunk abdominals and gluteus maximus. The exercise was further progressed to stepping sideways in standing with posteriorly tilted pelvis, which involved the co-ordinated activity between quadratus lumborum, adductor and abductors of the hips. Similar to the side-lying exercise, the triphasic burst of hip extensor and flexor was achieved during stepping-up over a small block kept in front. In addition, the hip muscles were progressively strengthened using a closed kinetic chain exercise machine.
- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 60 minutes, 3 times/week for 6 weeks
- Total minutes of intervention: 1080
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (If the intervention was intended to be personalised, titrated or adapted? What and how?): the exercise sets and intensity were designed based on the performance of the individual patient.
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): four dropouts
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: plinth, physio ball
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: the standard physiotherapy involved 30 minutes of a range of motion exercises, tone modulation strategies, stretching, synergy activity and strengthening of lower limb muscles in supine and sitting positions addressing the soft tissue stiffness, spasticity, muscle inactivity and weakness of the lower limb. Balance training in sitting and standing and gait training were administered to them for 30 minutes duration.
- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 60 minutes, 3 times/week for 6 weeks
- Total minutes of intervention: 1080
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported

Dubey 2018 *(Continued)*

- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): four dropouts
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes	Leg function • Outcome type: continuous outcome • Scale: Fugl-Meyer lower extremity • Direction: higher is better • Data value: change from baseline Walking ability • Outcome type: continuous outcome • Scale: gait speed • Unit of measure: m/s • Direction: higher is better • Data value: change from baseline Trunk function • Outcome type: continuous outcome • Scale: TIS • Range: 0-16 • Direction: higher is better • Data value: change from baseline Activities of daily living • Outcome type: continuous outcome • Scale: MBI • Range: 0-20 • Direction: higher is better • Data value: change from baseline
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Blocked randomisation method but no details were given for the size of the blocks
Allocation concealment (selection bias)	Low risk	Quote: "They were then assigned into either the experimental group (pelvic stability training) or control group (standard physiotherapy) through the block randomization method with concealed allocation using opaque sealed envelopes."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No description available in this trial

Dubey 2018 *(Continued)*

Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "daily living post stroke ... These outcomes were collected by an independent assessor who was involved in conducting neither the study intervention nor the randomization process. Statistical Analysis Data was analyzed".
Incomplete outcome data (attrition bias) All outcomes	High risk	Judgement comment: 4 dropouts in each group; reasons were not described in the study.
Selective reporting (reporting bias)	Low risk	Trial registration available; no suggestion of reporting bias
Other bias	Low risk	No other potential sources of bias found

El-Nashar 2019

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** the hypothesis of this study was that the core-stability exercises had an effect on the upper limb function and trunk balance in chronic stroke patients
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 59.86 ± 8.14 • Number of participants: 15 • Sex (women/men): not reported • Type of stroke event (I/H): not reported • Location of stroke event (L/R): not reported • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in years: 59.86 ± 8.14 Control group (same amount of additional therapy) • Mean age and standard deviation: 56.9 ± 7.24 • Number of participants: 15 • Sex (women/men): not reported • Type of stroke event (I/H): not reported • Location of stroke event (L/R): not reported • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in years: 3.15 ± 1.59 **Inclusion criteria:** patients with spasticity on the Modified Ashworth Scale between grade (+ 1 and 2), the duration of illness was more than 6 months, and age ranged between 45 and 60 years old. The affected upper limb had a moderate motor impairment. The scores of upper limb motor performance ranged from (19–40) according to Fugl-Meyer scale for the section of upper limb and hand

El-Nashar 2019 *(Continued)*

Exclusion criteria: patients with balance disturbance due to neurological disorders other than stroke (example: Parkinson's disease, inner ear, vestibular, or cerebellar dysfunctions), with musculoskeletal disorders such frozen shoulder or degenerative diseases affecting the posture and motor performance as ankylosing spondylitis, with communication problems, and those with a history of previous stroke or other neurologic diseases or disorders. Patients with pain, limited motion, or weakness in the non-paretic lower extremity that affect performance of daily activities, those with uncontrolled hypertension or symptomatic cardiac failure or unstable angina, and patients with respiratory disorders or conditions that may influence the posture of the skeletal system of the back (example: asthma). The patients with pain in non-paretic lower limb were excluded from our study because some exercises like bridging and quadruped involve weightbearing on both lower limbs which hampers the performance of the exercises.

Pretreatment: no significant group differences

Sample size calculation: not calculated

Interventions

Intervention characteristics

Experimental training

- Type of intervention: stretching exercises for shoulder girdle muscles such as pectoralis major muscle; the patient put both hands behind the head and the therapist was behind him attaching the elbow with pulling the arms backward, maintaining the action for 30 s; strengthening exercises for shoulder muscles including active resisted shoulder abduction — the patient was asked to do active resisted shoulder abduction within the available range of motion and within the limit of pain; active resisted shoulder external rotation — the patient was asked to do active resisted shoulder external rotation within the available range and against resistance keeping the trunk aligned; upper trapezius muscle strengthening — the patient performed the shoulder shrugging within the available range against suitable resistance while keeping the trunk well aligned. Serratus anterior muscle strengthening — the patient was asked to push forward by his upper limb against the applied resistance and was asked to keep proper trunk alignment and trunk control exercises including (active trunk flexion), the patient was sitting, and then was asked to do active trunk lateral flexion while the therapist guides the motion. Active trunk rotation — the patient was asked to do active trunk rotation while keeping the trunk in the extended position. Each exercise was repeated for ten times in two sets, giving rest in between for 10 s after each set. The core stabilisation exercises consisted of two subparts: first, the bed exercises that consist of bridge exercise — patient lies supine with hips and knees bent 90° with feet flat on floor and palms are down at sides, draw in the abdominal muscles and then slowly raising buttocks off the table by using gluteus and hamstrings; bridge exercise with legs crossed — patient lies supine with one hip and knee bent to 90° with feet flat on floor and another leg rested on the opposite knee and palm-down at sides then draw in abdominal muscles then slowly raising his buttocks off the table by using his gluteus and hamstrings; bridge exercise with one leg — patient lies supine with his knees bent and his feet flat on the floor. The patient lifts pelvis forming a bridge. Then lifting right leg off the floor and extends it. Curl-ups with straight reaching — patient lies supine with his knees bent and his feet flat on the floor. "Crunch" or curl his stomach to lift the shoulders just off the floor. Curl-ups with diagonal reaching — patient lies supine with his knees bent and his feet flat on the floor. The patient crunches or curls the stomach to lift the shoulders off the floor and twists, reaching his right elbow towards his left leg. Then returning to the floor and repeat twisting in the opposite direction lifting his shoulders just off the floor. Quadruped exercise — patient balances on the floor on his hands and knees. The patient's back should be flat and hips parallel to the floor. Then the patient is asked to do cat and camel motion (spine flexion and extension). Bird dog exercise — patient balances on the floor on his hands and knees. The patient's back should be flat and hips parallel to the floor. The patient raises his right arm out in front of him and raises his left leg out behind him, keeping it straight. At each exercise, there is hold for 3–5 s and repetition from 10 to 20 times. The second subpart is the ball exercises that consisted of bridge exercise — the patient lies supine on the floor with knees straight, feet resting on physio-ball, arms at sides; draw in abdominal muscles; slowly lift the buttocks off floor and segmental rotation — the patient lies supine on the floor with hips and knees bent to 90° over a physio-ball; draw in abdominal muscles; slowly and with control, rotate knees to one side keeping hips in contact with the floor; engage abdominal obliques to pull knees back to centre and repeat on the opposite side.
- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 3 sessions/week, 6 weeks, 30 minutes each session
- Total minutes of intervention: 540

El-Nashar 2019 *(Continued)*

- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 5 dropouts out of 20 (25%)
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: stretching exercises for shoulder girdle muscles such as pectoralis major muscle; the patient puts both hands behind the head and the therapist was behind him attaching the elbow with pulling the arms backward, maintaining the action for 30 s; strengthening exercises for shoulder muscles including active resisted shoulder abduction — the patient was asked to do active resisted shoulder abduction within the available range of motion and within the limit of pain; active resisted shoulder external rotation — the patient was asked to do active resisted shoulder external rotation within the available range and against resistance keeping the trunk aligned; upper trapezius muscle strengthening — the patient performed the shoulder shrugging within the available range against suitable resistance while keeping the trunk well aligned. Serratus anterior muscle strengthening — the patient was asked to push forward by his upper limb against the applied resistance and was asked to keep proper trunk alignment and trunk control exercises including (active trunk flexion), the patient was sitting, and then was asked to do active trunk lateral flexion while the therapist guides the motion. Active trunk rotation — the patient was asked to do active trunk rotation while keeping the trunk in the extended position. Each exercise was repeated for ten times in two sets, giving rest in between for 10 s after each set.
- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 3 sessions/week, 6 weeks, 30 minutes each session
- Total minutes of intervention: 540
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 7 dropouts out of 22 (32%)
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes	Arm-hand activity • Outcome type: continuous outcome • Scale: Wolf Motor Function Test • Direction: higher is better • Data value: pre- and post-value
Notes	

El-Nashar 2019 *(Continued)*

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Study participants were randomly allocated to either control group (group A) or study group (group B) by means of a random computer-generated list specific to each center." Judgement comment: random allocation using a computer program. However, not many details about the computer program were provided.
Allocation concealment (selection bias)	Low risk	Quote: "The method of allocation was concealed in sequentially numbered, sealed envelopes."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Judgement comment: not reported
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Judgement comment: not reported
Incomplete outcome data (attrition bias) All outcomes	High risk	Judgement comment: the dropout rate was high (5/20 for the experimental group, 7/22 for the control group).
Selective reporting (reporting bias)	High risk	Judgement comment: no registration, no standard deviation reported
Other bias	Unclear risk	/

Fujino 2016

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to examine the effects of lateral sitting training on a tilting platform on trunk functions in persons with acute stroke
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 67.9 ± 7.8 • Number of participants: 15 • Sex (women/men): 5/10 • Type of stroke event (I/H): 10/5 • Location of stroke event (L/R): 4/11 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in days: 10.6 ± 2.7

Fujino 2016 *(Continued)*

Control group (same amount of additional therapy)

- Mean age and SD: 64.4 ± 7.5
- Number of participants: 15
- Sex (women/men): 4/11
- Type of stroke event (I/H): 10/5
- Location of stroke event (L/R): 6/9
- Stroke severity at baseline, by means of the NIHSS)or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in days: 10.2 ± 2.6

Inclusion criteria: participants had to meet the following criteria: (1) over 20 years old; (2) no past history of stroke; (3) supratentorial lesion of the brain; (4) stable neurological symptoms and general condition; (5) ability to sit without support; (6) the trunk function evaluation (described below) score was not maximal at the start of study; (7) no dementia or psychiatric disorder; (8) ability to understand instructions; (9) no orthopaedic problem that would interfere with the ability to perform lateral sitting training; and (10) able to provide informed consent

Excluded criteria: not reported

Pretreatment: no significant differences were observed between the experimental and control groups.

Sample size calculation: to determine the power of the main effects and the interaction, a post hoc power calculation was performed using G*Power3 (Heinrich Heine University, Düsseldorf, Germany). The power (1{b) was calculated from the number of samples in the study (n = 530), the effect size (f = 50.4) according to the criteria of Cohen, and the significance level (P = 0.05)

Interventions

Intervention characteristics

Experimental training

- Type of intervention: standardised lateral sitting training on a platform tilted 10° to the paretic side in the frontal plane. They were asked to move their trunk laterally from the paretic side to the non-paretic side. After lateral movement of the trunk to a vertical visual target, patients were tilted (back) to the paretic side as much as possible under their own control. Patients were instructed to gaze at a visual clue and to refrain from rotating their trunk. This training was focused on the patients controlling their posture actively and was set to a comfortable speed for the patients.
- Length of intervention in minutes, days, or weeks: 1 week
- Total number of repetitions: 60 times/session, with 6 sessions/week
- Total minutes of intervention: 360
- Total minutes of conventional therapy: 60 minutes /day, 1 week: 300 minutes
- Content of standard care: the conventional programme is patient-specific and consists of usual physiotherapy, occupational therapy, neuropsychological therapy, speech therapy, and nursing care. Usual physiotherapy includes mobilisation, sit-to-stand training, gait training, and ADL training
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 5 dropouts
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: exercise table
- Reporting of death and serious adverse events, including falls: not reported

Fujino 2016 *(Continued)*

	Control group (same amount of additional therapy) • Type of intervention: standardised lateral sitting training, the controls sat on a horizontal platform and move their trunk laterally from the paretic side to the non paretic side. After lateral movement of the trunk to a vertical visual target, patients were tilted (back) to the paretic side as much as possible under their own control. • Length of intervention in minutes, days, or weeks: 1 week • Total number of repetitions: 60 times/session, with 6 sessions/week • Total minutes of intervention: 360 • Total minutes of conventional therapy: 60 minutes /day, 1 week, 300 minutes • Content of standard care: the conventional programme is patient-specific and consists of usual physiotherapy, occupational therapy, neuro-psychological therapy, speech therapy, and nursing care. Usual physiotherapy includes mobilisation, sit-to-stand training, gait training, and ADL training. • Who provided study therapy: not reported • How provided (face-to-face, internet, telephone, individual, in group): face-to-face • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported • Modification (intervention was modified during the course of the study?): not reported • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 5 dropouts • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported • Material used: exercise table • Reporting of death and serious adverse events, including falls: not reported
Outcomes	Trunk function • Outcome type: continuous outcome • Scale: Trunk Control Test • Direction: higher is better • Data value: change from baseline
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Block randomisation; no details on the size of the blocks
Allocation concealment (selection bias)	Low risk	Quote: "control group by block randomization. The method of allocation was concealed in sequentially numbered, sealed, opaque envelopes. Randomization was done ..."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No blinding
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Third author (KF) undertaking the assessment of the outcome measurements did not know which group the patients were in.
Incomplete outcome data (attrition bias)	Low risk	Judgement comment: no dropouts in the intervention phase

Fujino 2016 *(Continued)*
All outcomes

Selective reporting (reporting bias)	Low risk	Registration available (Clinical Trial Registration Number UMIN000015948)
Other bias	Low risk	No other potential sources of bias found

Fukata 2019

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to clarify the effects of repetitive diagonally aligned sitting training in this phase
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 68.9 ± 9.6 • Number of participants: 16 • Sex (women/men): 7/9 • Type of stroke event (I/H): 10/6 • Location of stroke event (L/R): 6/10 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in days: 13.9 ± 5.1 Control group (same amount of additional therapy) • Mean age and SD: 67.6 ± 12.7 • Number of participants: 17 • Sex (women/men): 6/11 • Type of stroke event (I/H): 8/9 • Location of stroke event (L/R): 5/12 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in days: 16.1 ± 6.5 **Inclusion criteria:** (1) first stroke; (2) < 60 days from stroke onset; (3) > 20 years old; (4) sitting quietly subscore of function in sitting test (FIST) of (i) physical assistance needed to maintain sitting, (ii) unable to maintain sitting without using upper extremities for support or assistance, or (iii) able to sit independently but may need verbal cues or excessive time points; (5) unable to perform static standing independently without use of the upper limbs or a leg brace; (6) stable neurological symptoms and general condition; (7) no history of orthopaedic disease or neurological disorder (Parkinson's disease or syndrome, spinocerebellar degeneration, or multiple sclerosis); (8) no dementia or psychiatric disorder; and (9) able to understand instructions **Exclusion criteria:** not reported **Pretreatment:** no significant differences at baseline

Fukata 2019 *(Continued)*

Sample size calculation: only post hoc power calculation

Interventions	**Intervention characteristics** Experimental training • Type of intervention: the intervention was performed in both groups using an electrical vertical board (EVB; Pair Support Corporation, Saitama, Japan); i.e. a motor-driven posterior- and lateral-walled sitting device. In the experimental group, the patient sat on the device tilted 10 diagonally backward and down towards the most affected side and was asked to move their trunk diagonally forward towards the least affected side, while looking at the vertical indicator. • Length of intervention in minutes, days, or weeks: 8 days • Total number of repetitions: 40 times/session for seven sessions over 8 days, 10 minutes • Total minutes of intervention: 70 minutes • Total minutes of conventional therapy: 560 to 840 minutes • Content of standard care: physical, occupational, and speech therapy as well as nursing care. Physical therapy included early mobilisation, sit-to-stand training, and gait training with lower-extremity orthoses and/or walking aids. Occupational therapy included upper limb training of the paretic side and ADLs training (eating, toileting, dressing, etc). Speech therapy comprised treatment for dysarthria or aphasia, swallowing training, and face training. • Who provided study therapy: training therapist • How provided (face-to-face, internet, telephone, individual, in group): training therapist stood at the patient's side, which was anterior to the most affected side, and provided verbal instructions with minimal assistance, as necessary. • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): the inclination angle of the trunk was gradually increased according to the patients' ability. • Modification (intervention was modified during the course of the study?): not reported • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 2 dropouts (discharge and personal reason) • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported • Material used: electrical vertical board (EVB; Pair Support Corporation, Saitama, Japan) • Reporting of death and serious adverse events, including falls: no adverse events occurred during the study period. Control group (same amount of additional therapy) • Type of intervention: patient performed the exercise on a horizontal surface and actively moved their trunk diagonally forward towards the least affected side. The intervention was performed using an electrical vertical board (EVB; Pair Support Corporation, Saitama, Japan); i.e. a motor-driven posterior- and lateral-walled sitting device. The lateral wall width could be adjusted according to the patient's body. The paretic side and back torso were supported with vertical walls, and the patient sat on the electrical vertical board with their feet without ground contact. A drip infusion stand was used as a vertical indicator and placed at a 45° angle towards the non-paretic side from the midline, 1 metre from the patient. • Length of intervention in minutes, days, or weeks: 8 days • Total number of repetitions: 40 times/session for 7 sessions over 8 days, 10 minutes • Total minutes of intervention: 70 minutes • Total minutes of conventional therapy: 560 to 840 minutes • Content of standard care: physical, occupational, and speech therapy as well as nursing care. Physical therapy included early mobilisation, sit-to-stand training, and gait training with lower-extremity orthoses and/or walking aids. Occupational therapy included upper limb training of the paretic side and ADL training (eating, toileting, dressing, etc). Speech therapy comprised treatment for dysarthria or aphasia, swallowing training, and face training • Who provided study therapy: training therapist • How provided (face-to-face, internet, telephone, individual, in group): training therapist stood at the patient's side, which was anterior to the most affected side, and provided verbal instructions with minimal assistance, as necessary.

Fukata 2019 *(Continued)*

- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 3 dropouts (discharge: 2; personal reason: 1)
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: electrical vertical board (EVB; Pair Support Corporation, Saitama, Japan)
- Reporting of death and serious adverse events, including falls: no adverse events occurred during the study period.

Outcomes

Trunk Control Test

- Outcome type: continuous outcome
- Range: 0-100
- Direction: higher is better

Functional Independence Measure - cognitive

- Outcome type: continuous outcome
- Range: 0-35
- Direction: higher is better
- Data value: change from baseline

Trunk function

- Outcome type: continuous outcome
- Scale: TIS 1.0
- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Activities of daily living

- Outcome type: continuous outcome
- Scale: Functional Independence Measure - motor
- Range: 0-91
- Direction: higher is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Patients who provided consent were allocated to the experimental or control groups through block randomisation."
Allocation concealment (selection bias)	Low risk	Quote: "Randomisation codes were concealed in sequentially numbered, sealed, opaque envelopes. Group allocation was performed by therapists who were not involved in the interventions or assessments."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No description available in this trial

Fukata 2019 *(Continued)*

Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "The trial assessor was blinded to group allocation."
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No registration available; not enough details of dropouts
Selective reporting (reporting bias)	Low risk	Presenting significant and insignificant results
Other bias	Low risk	No other potential sources of bias found

Haruyama 2017

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to investigate the effectiveness of core-stability training in improving trunk function, standing balance, and mobility among patients showing hemiplegia after stroke
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 67.5 ± 10.11 • Number of participants: 16 • Sex (women/men): 3/13 • Type of stroke event (I/H): 7/9 • Location of stroke event (L/R): 7/9 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and (lower quartile, upper quartile) after stroke in days: 66 [49.25-91.5] Control group (same amount of additional therapy) • Mean age and SD 65. 63 ± 11.97 • Number of participants: 16 • Sex (women/men): 4/12 • Type of stroke event (I/H): 7/9 • Location of stroke event (L/R): 8/8 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and (lower quartile, upper quartile) after stroke in days: 72 [48.25-93.5] **Inclusion criteria:** a history of first stroke, definite diagnosis of stroke based on computed tomography and/or magnetic resonance imaging, a supratentorial and hemispheric lesion, and more than 1 month and less than 6 months since onset

Haruyama 2017 *(Continued)*

Exclusion criteria: age 80 years or more, inability to keep a sitting position for 30 seconds, communication problems, comorbidities affecting motor performance such as orthopaedic and neurological disorders that could influence postural control, maximum score (score = 23) for trunk performance as assessed by the TIS at the start of the study, or lack of provision of consent to participate

Pretreatment: we performed interim analysis as soon as the sample size reached the prescribed number based on the adaptive sequential design, confirming sufficient power to identify significant differences in primary outcome measures. However, differences at baseline were observed in some secondary outcomes and recruitment was therefore continued. When baseline equalisation was confirmed on continual interim analysis at the inclusion of 32 participants, recruitment to the study was ended.

Sample size calculation: the number of patients required for this study was calculated a priori to ensure sufficient statistical power. Power estimates were based on a prior study investigating the effect of improvements in TIS. This revealed that a sample size of 28 patients would be necessary to achieve an 80% chance (effect size = 0.39, α = 0.05, power = 0.80).

Interventions

Intervention characteristics

Experimental training

- Type of intervention: the core-stability training consisted of ADIM as a selective contraction of TrA, selective movements of the pelvis, and pelvic movements with ADIM. In this training, we increased the level of exercise in stages according to our protocol. For ADIM, participants were instructed to draw the lower part of the abdomen up and in towards the spine, without movement of the trunk or pelvis while continuing to breathe normally. ADIM was performed in a crook lying position, then in a sitting position. Pelvic control exercises were composed from the following three planes of movement: anterior-posterior tilt; lateral lift; and transverse rotation. Any selective movement of the pelvis was conducted in the sitting position, and compensatory movements were inhibited. Furthermore, motions were performed repeatedly to the maximum range voluntarily possible at a low load. In pelvic control exercises with ADIM, selective pelvic movement was performed while drawing in the abdomen. If any movement was insufficient, the physical therapist provided additional verbal instructions, manipulative induction, or assistance. Propriety of ADIM was judged based on palpation of TrA contraction. All exercises in the sitting position emphasised an upright sitting posture.
- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 5 sessions/week, 4 weeks, 20 minutes
- Total minutes of intervention: 400
- Total minutes of conventional therapy: physical therapy: 1440.00 (129.40), occupation therapy: 1432.50 (156.27)/40 minutes/day, 5 times a week
- Content of standard care: This conventional treatment programme is patient-specific and consists mainly of physical therapy, occupational therapy, speech therapy, and nursing care. The physical therapy programme takes a comprehensive approach, such as improvement of functions and disabilities, including trunk movement, basic activity, task-directed training, and a compensatory approach using supplementary devices. In both groups, activities such as bridge, pelvic movement, and reaching exercises commonly performed in clinical settings were included in the conventional programme. We provided physical therapy for approximately 60 minutes/day, 5 times a week in both groups. The experimental group intervention was carried out within this time, so overall rehabilitation time provided did not differ between groups.
- Who provided study therapy: 11 physical therapists not involved in the study
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: no adverse events

Haruyama 2017 *(Continued)*

	Control group (same amount of additional therapy) • Type of intervention: conventional therapy • Length of intervention in minutes, days, or weeks: 4 weeks • Total number of repetitions: 5 sessions/week, 4 weeks, 20 minutes • Total minutes of intervention: 400 • Total minutes of conventional therapy: physical therapy: 1301.25 (281.75), occupation therapy: 1316.25 (209.15)/40 minutes/day, 5 times a week • Content of standard care: This conventional treatment programme is patient-specific and consists mainly of physical therapy, occupational therapy, speech therapy, and nursing care. The physical therapy programme takes a comprehensive approach, such as improvement of functions and disabilities, including trunk movement, basic activity, task-directed training, and a compensatory approach using supplementary devices. In both groups, activities such as bridge, pelvic movement, and reaching exercises commonly performed in clinical settings were included in the conventional programme. • Who provided study therapy: not reported • How provided (face-to-face, internet, telephone, individual, in group): not reported • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported • Modification (intervention was modified during the course of the study?): not reported • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): one dropout (change of hospital), one additional person had early discharge; data were included in the study. • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported • Material used: not reported • Reporting of death and serious adverse events, including falls: no adverse events
Outcomes	Trunk function • Outcome type: continuous outcome • Scale: TIS 1.0 • Range: 0-23 • Direction: higher is better • Data value: change from baseline Standing balance • Outcome type: continuous outcome • Scale: Functional Reach Test (standing) • Unit of measure: cm • Direction: higher is better • Data value: change from baseline Walking ability • Outcome type: continuous outcome • Scale: TUG • Unit of measure: s • Direction: lower is better • Data value: change from baseline
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement

Haruyama 2017 *(Continued)*

Random sequence generation (selection bias)	Low risk	Quote: "To allocate patients to one of these groups, occupational therapists who were blinded to the research performed assignments based on a computer-generated random number." Quote: "To exclude the influence of effects due to differences in trunk function at baseline, we adopted a permuted-block method combined with stratified randomization using the total TIS score. The block size was 2." Quote: "Total TIS score was stratified to ≥ 14 or < 14, based on the median score reported for stroke patients."
Allocation concealment (selection bias)	Low risk	Judgement comment: to allocate patients to one of these groups, occupational therapists who were blinded to the research performed assignments based on a computer-generated random number.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not described if personnel and participants were blinded in this trial
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "This study was designed as an assessor-blinded randomized controlled trial."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Two dropouts in the control intervention of total sample size of 33 participants
Selective reporting (reporting bias)	Low risk	Judgement comment: no selective outcome reporting according to the clinical trial registration
Other bias	Low risk	No other potential sources of bias found

Jung 2014

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to investigate the effects of weight-shift training on an unstable surface in sitting position on trunk control, proprioception, and dynamic balance during gait in patients with chronic stroke
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 51.9 ± 10.3 • Number of participants: 9 • Sex (women/men): 2/7 • Type of stroke event (I/H): 6/3 • Location of stroke event (L/R): 4/5 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 15.3 ± 9.5

Jung 2014 *(Continued)*

Control group (same amount of additional therapy)

- Mean age and SD: 57.9 ± 8.5
- Number of participants: 8
- Sex (women/men): 2/6
- Type of stroke event (I/H): 6/2
- Location of stroke event (L/R): 3/5
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 14.4 ± 11.2

Inclusion criteria: those who were diagnosed with first onset of unilateral hemisphere stroke more than six months ago, those who had no neglect of paretic limbs, could sit independently for 30 seconds on a stable surface, were medically stable, had no peripheral neuritis, had no musculoskeletal problems such as low back pain or arthritis affecting motor performance, and were able to understand and follow simple verbal instructions

Excluded criteria: none reported

Pretreatment: no significant difference was found in general characteristics and pre-test scores between the WST and control groups before treatment.

Sample size calculation: the total sample size was 18, which was calculated to maintain alpha error probability (0.05), power (0.95), and effect size (1.65) in difference between two independent means.

Interventions	**Intervention characteristics** Experimental training • Type of intervention: weight-shift training on an unstable surface using a Balance Pad (Airex®, Aalen, Germany) and Dynamic Ball Cushion (Dynair® ball cushion Deko, TOGU, Germany). WST group was performed in two sitting postures, which was a modified version of the intervention studied and suggested by Verheyden 2009. Two sitting postures were performed on an exercise mat; one with the knees extended and one with the knees flexed on the edge of the testing table. To identify the training protocol for weight-shifting, each subject's range of weight-shifting was measured by a piece of graph paper placed behind the participant's back. Participants were instructed to sit with their arms folded and to shift their weights from midline to the right and left, as far as they could. When the maximum range of weight-shifting was defined on each side of the movement on a stable surface, a bar was placed 2 cm closer to the patient as a target marker for the WST programme.The WST group was performed in four conditions. For the first condition weight shift, participants were instructed to sit on an exercise mat with legs extended, and have a balance pad under their buttocks. The second weight-shift condition was to sit with legs extended, have a balance pad under the buttocks, and a balance cushion under both heels. For the third weight-shift condition, participants were to sit on the edge of a testing table with a balance pad under the buttocks. The fourth weight-shift condition was to sit on the edge of a testing table, have a balance pad under the buttocks, and a balance cushion under the feet. Conditions 1 and 2 had a higher level of difficulty, because the subject was to sit with the knees extended, which makes the buttocks the centre of gravity. These two conditions often made the participant form a round back, and thus tactile and verbal cues to "straighten your back" were continuously given while the therapist verified to see that the back was straightened. The acromion was the landmark for the weight-shift movement, where a marker was attached on the right and left side. Participants were instructed to shift their weight and touch the bar placed on both sides by elongating the trunk on the weight-shifting side. Participants were to hold the position for 10 seconds when they reached the target point by shifting weight, and then return to the starting position; this was counted as one trial. • Length of intervention in minutes, days, or weeks: 4 weeks • Total number of repetitions: 5 sessions/week, 4 weeks, 30 minutes per session • Total minutes of intervention: 600 • Total minutes of conventional therapy: 600

Jung 2014 *(Continued)*

- Content of standard care: the conventional exercise programme was patient-specific and consisted of physiotherapy including stretching, strengthening, and stationary bicycle. Therapists combined elements from different neurological treatment concepts, but the main emphasis was on the neurodevelopmental treatment concept and on motor relearning.
- Who provided study therapy: two physical therapists
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: exercise mat, piece of graph paper
- Reporting of death and serious adverse events, including falls: not reported.

Control group (same amount of additional therapy)

- Type of intervention: conventional therapy
- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 5 sessions/week, 4 weeks, 30 minutes per session
- Total minutes of intervention: 600
- Total minutes of conventional therapy: 600
- Content of standard care: the conventional exercise programme was patient-specific and consisted of physiotherapy including stretching, strengthening, and stationary bicycle. Therapists combined elements from different neurological treatment concepts, but the main emphasis was on the neurodevelopmental treatment concept and on motor relearning.
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes

Walking ability

- Outcome type: continuous outcome
- Scale: TUG
- Unit of measure: s
- Direction: lower is better
- Data value: change from baseline

Trunk function

- Outcome type: continuous outcome
- Scale: TIS
- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Notes

Jung 2014 *(Continued)*

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "by randomly selecting from a sealed envelope for allocation"
Allocation concealment (selection bias)	Low risk	Judgement comment: randomly selected from a sealed envelope for allocation
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not described by the study authors
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "This study was observer-blinded".
Incomplete outcome data (attrition bias) All outcomes	Low risk	Judgement comment: 5% dropout and the reason for the dropout was described.
Selective reporting (reporting bias)	Low risk	Judgement comment: no study registration was available but both significant and insignificant results were shown.
Other bias	Low risk	No other potential sources of bias found

Jung 2016a

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Why:** this study analysed the effects of weight-shifting exercise (WSE) on an unstable surface combined with TENS, applied to the ES and EO muscles, on trunk control and trunk muscle activity
Participants	**Baseline characteristics** Experimental training (electrostimulation) • Mean age and SD: 55.3 ± 8.3 • Number of participants: 20 • Sex (women/men): 8/12 • Type of stroke event (I/H): 13/7 • Location of stroke event (L/R): 9/11 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 5.6 ± 2.4 Experimental group (weight-shift training) • Mean age and SD: 55.4 ± 10.4

Jung 2016a *(Continued)*

- Number of participants: 20
- Sex (women/men): 7/13
- Type of stroke event (I/H): 11/9
- Location of stroke event (L/R): 9/11
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 5.0 ± 2.1

Control group (same amount of additional therapy)

- Mean age and SD: 56.1 ± 10.8
- Number of participants: 20
- Sex (women/men): 9/11
- Type of stroke event (I/H): 12/8
- Location of stroke event (L/R): 10/10
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 5.9 ± 2.2

Inclusion criteria: diagnosed with first onset of unilateral hemisphere stroke, able to sit independently for 30 seconds on a stable surface, medically stable, no unilateral neglect as indicated by star cancellation test scores over 47, no severe sensory deficits in the pinprick test, no musculoskeletal problems such as low back pain or arthritis affecting motor performance and able to understand and follow simple verbal instructions

Exclusion criteria: none reported

Pretreatment: no significant group differences at baseline

Sample size calculation: none

Interventions

Intervention characteristics

Experimental training (electrostimulation)

- Type of intervention: the participants were instructed to sit with their arms folded and to shift their weight to the right and the left as far as possible. A piece of graph paper was placed behind the participant's back to measure range of weight-shifting. The maximum range of weight-shifting was measured on a stable surface before training, and the bar was installed at the location that was 2 cm closer to the patient from the maximum range of weight-shifting. The markers were attached to the bilateral acromion. The participants were instructed to shift their weight and hold their position for 10 seconds when their marker reached the target point and then return to the starting position + electrical stimulation (two to three times the sensory threshold, 100 Hz; 200 μs) was applied to the muscle belly of the ES and EO using a TENS machine.
- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 5 sessions/week, 6 weeks, 30 minutes per session
- Total minutes of intervention: 900 minutes
- Total minutes of conventional therapy: 1800
- Content of standard care: neurodevelopmental treatment and motor relearning based in the Bobath technique, such as tone facilitation a range of movement exercise
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported

Jung 2016a *(Continued)*

- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): the range of movement was newly set every week for each patient based on the maximum range of weight-shifting.
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: piece of graph paper, balance pad, TENS machine (TENS-7000, Koalaty Products Inc., USA), electrodes
- Reporting of death and serious adverse events, including falls: not reported

Experimental group (weight-shift training)

- Type of intervention: The participants were instructed to sit with their arms folded and to shift their weight to the right and the left as far as possible. A piece of graph paper was placed behind the participant's back to measure range of weight-shifting. The maximum range of weight-shifting was measured on a stable surface before training, and the bar was installed at the location that was 2 cm closer to the patient from the maximum range of weight-shifting. The markers were attached to the bilateral acromion. The participants were instructed to shift their weight and hold their position for 10 seconds when their marker reached the target point and then return to the starting position + electrodes were attached at the same location (ES and EO) but electrical stimulation was not applied
- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 5 sessions/week, 6 weeks, 30 minutes per session
- Total minutes of intervention: 900 minutes
- Total minutes of conventional therapy: 1800 minutes
- Content of standard care: neurodevelopmental treatment and motor relearning based in the Bobath technique, such as tone facilitation and a range of movement exercise
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): the range of movement was newly set every week for each patient based on the maximum range of weight-shifting.
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: piece of graph paper, balance pad
- Reporting of death and serious adverse events, including falls: no adverse events reported

Control group (same amount of additional therapy)

- Type of intervention: stretching exercise on supine, prone and side-lying position on limbs and trunk and stationary bicycle exercise for the same amount of time
- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 5 sessions/week, 6 weeks, 30 minutes per session
- Total minutes of intervention: 900
- Total minutes of conventional therapy: 1800
- Content of standard care: neurodevelopmental treatment and motor relearning based in the Bobath technique, such as tone facilitation and a range of movement exercise
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported

Jung 2016a *(Continued)*

	• How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported • Material used: stationary bicycle • Reporting of death and serious adverse events, including falls: not reported
Outcomes	Trunk function • Outcome type: continuous outcome • Scale: TIS 1.0 • Range: 0-23 • Direction: higher is better • Data value: change from baseline
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "randomly"
Allocation concealment (selection bias)	Unclear risk	Quote: "randomly assigned to the three groups by selection from a sealed envelope for allocation." Judgement comment: not described if the sealed envelopes were opaque envelopes.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Judgement comment: not described in this trial
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not clearly described if assessor was blinded
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not described with sufficient details by the study authors
Selective reporting (reporting bias)	Low risk	Judgement comment: no study registration available. There were both significant and insignificant differences between the experimental groups and control group.
Other bias	Low risk	No other potential sources of bias found

Jung 2016b

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group

Jung 2016b *(Continued)*

	Aim: to investigate the effects of trunk exercise on an unstable surface on trunk muscle activation, postural control, and gait speed in stroke patients
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 58.9 ± 11.0 • Number of participants: 12 • Sex (women/men): 4/8 • Type of stroke event (I/H): 8/4 • Location of stroke event (L/R): 5/7 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 8.0 ± 3.2 Control group (same amount of additional therapy) • Mean age and SD: 60.7 ± 7.8 • Number of participants: 12 • Sex (women/men): 6/6 • Type of stroke event (I/H): 7/5 • Location of stroke event (L/R): 6/6 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 8.4 ± 2.4 **Inclusion criteria:** diagnosed with the first onset of unilateral hemispheric stroke, had no neglect of paretic limbs, could sit independently for 30 s on a stable surface, were medically stable, had no peripheral neuritis, had no musculoskeletal problems such as low back pain or arthritis affecting motor performance, and could understand and follow simple verbal instructions were included in the study. **Exclusion criteria:** none **Pretreatment:** no significant difference was found in the general characteristics and pretest scores between the experimental and control groups at baseline. **Sample size calculation:** none
Interventions	**Intervention characteristics** Experimental training • Type of intervention: on unstable balance pad: trunk exercises included weight-shifting and arm flexion in the sitting position. During the weight-shifting exercise, the participants were instructed to sit with their arms folded and to shift their weights from midline to the right and left, as far as they could, and touch a bar placed on both sides. During the arm-flexion exercise, the participants were instructed to flex both their arms as high as they could. • Length of intervention in minutes, days, or weeks: 4 weeks • Total number of repetitions: 5 sessions/week, 4 weeks, 30 minutes each session • Total minutes of intervention: 600 • Total minutes of conventional therapy: not reported • Content of standard care: not reported • Who provided study therapy: not reported

Jung 2016b *(Continued)*

- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned: not reported
- Material used: balance mat
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: on stable surface: trunk exercises included weight-shifting and arm flexion in the sitting position. During the weight-shifting exercise, the participants were instructed to sit with their arms folded and to shift their weights from midline to the right and left, as far as they could, and touch a bar placed on both sides. During the arm-flexion exercise, the participants were instructed to flex both their arms as high as they could.
- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 5 sessions/week, 4 weeks, 30 minutes each session
- Total minutes of intervention: 600
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned: not reported
- Material used: Stable surface
- Reporting of death and serious adverse events, including falls: not reported

Outcomes

Trunk function

- Outcome type: continuous outcome
- Scale: TIS 1.0
- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Walking ability

- Outcome type: continuous outcome
- Scale: 10 metre walk test
- Unit of measure: s
- Direction: lower is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement

Jung 2016b *(Continued)*

Random sequence generation (selection bias)	Unclear risk	Quote: "this study was randomly distributed into experimental (n = 12) and control groups (n = 12)."
Allocation concealment (selection bias)	Unclear risk	Not clearly described
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not clearly described in manuscript
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not clearly described in manuscript
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not clearly described in manuscript
Selective reporting (reporting bias)	Unclear risk	Not clearly described in manuscript; no registration available
Other bias	Unclear risk	Not clearly described in manuscript - permitting judgement of 'low risk' or 'high risk' was not possible.

Jung 2017

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to verify these effects in stroke patients by educating them in the precise exercise methods for isolated transversus abdominis contraction using real-time ultrasound imaging and applying audiovisual biofeedback-based trunk stabilisation training using a pressure biofeedback unit
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 62.52 ± 8.82 • Number of participants: 21 • Sex (women/men): 7/14 • Type of stroke event (I/H): 15/6 • Location of stroke event (L/R): 12/9 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 15.38 ± 7.45 Control group (same amount of additional therapy) • Mean age and SD: 64.55 ± 10.67 • Number of participants: 22 • Sex (women/men): 9/13

Jung 2017 *(Continued)*

- Type of stroke event (I/H): 14/8
- Location of stroke event (L/R): 11/11
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 16.45 ± 6.96

Inclusion criteria: hemiplegic patients who had been diagnosed with stroke at least 6 months ago; patients who had experienced only 1 stroke; patients who scored at least 24 points on the MMSE; patients capable of unassisted sitting for at least 10 minutes; patients capable of gait for a distance of at least 10 m independently, with or without assistive tools; and patients with a Brunnstrom motor recovery stage of at least 4

Exclusion criteria: patients participating in another experiment that could affect this study; patients with visual or auditory abnormalities such as vestibular disease, cerebellar disease, unilateral neglect, or apraxia; patients with brain abnormalities outside of the stroke region such as the cerebellum or brainstem;patients with a surgical condition such as a lower limb fracture or peripheral nerve damage; patients with severe renal, musculoskeletal, or cardiovascular disease that would impair training; and patients with visual disability, loss of visual field, or auditory disability

Pretreatment: no significant differences in general characteristics and dependent variables were observed between the experimental and control group.

Sample size calculation: to determine the sample size, the G-Power 3.19 software was used. To calculate the sample size,the probability of alpha error and power were set at 0.05 and 0.8, respectively. In addition, the effect size was set at 0.92, based on the trunk ability results in a prior pilot test. Therefore, a sample size of 20 patients per group was necessary. By estimating a dropout rate of about 15%, 23 participants per group needed to be recruited for randomisation.

Interventions

Intervention characteristics

Experimental training

- Type of intervention: the patients assumed the supine position with the knees raised. Three pressure biofeedback system were used to provide audiovisual-biofeedback-based trunk-stabilisation training. The stabiliser pressure was maintained at 40 mmHg, so that the patient would perform the abdominal drawing-in manoeuvre (ADIM). If the patient was unable to maintain the proper ADIM, and the pressure exceeded the acceptable range, a red light was seen on the monitor and a warning sound was heard. To stabilise the trunk, 4 stages of the sliding movement were performed, with the stabiliser pressure maintained. During the sliding exercise, the patient fully extended the bent knees and then returned to the original position.
- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 5 sessions/week, for 6 weeks, 50 minutes/session
- Total minutes of intervention: 1500
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: PBSs (Achievo CST, V2U Healthcare, Pte., Ltd,Singapore), monitor
- Reporting of death and serious adverse events, including falls: not reported

Jung 2017 *(Continued)*

	Control group (same amount of additional therapy) • Type of intervention: trunk stabilisation training (abdominal drawing-in manoeuvre) without any biofeedback • Length of intervention in minutes, days, or weeks: 6 weeks • Total number of repetitions: 5 sessions/week, for 6 weeks, 50 minutes/session • Total minutes of intervention: 1500 • Total minutes of conventional therapy: not reported • Content of standard care: not reported • Who provided study therapy: not reported • How provided (face-to-face, internet, telephone, individual, in group): not reported • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported • Modification (intervention was modified during the course of the study?): not reported • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported • Material used: not reported • Reporting of death and serious adverse events, including falls: not reported
Outcomes	Trunk function • Outcome type: continuous outcome • Scale: Modified Functional Reach Test-anterior reach (cm) • Unit of measure: cm • Direction: higher is better • Data value: change from baseline
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Random allocation software was used to minimise selection bias.
Allocation concealment (selection bias)	Unclear risk	Not clearly described in manuscript; we were not able to conduct the randomisation with the provided information.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not described by the study authors
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "The tests were performed by the trained assessors, and the assessors were blinded to the subjects' groups."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "subjects who became unable to participate in the program during the study due to a change in medical status, or who were unable to receive the post-training tests, were excluded from the final analysis. In the experimental group, statistical analysis was conducted on 21 patients, excluding 2 who were unable to participate in post-training tests, and in the control group, the final analysis was conducted on 22 patients, excluding 1 patient who was unable to participate in post-training tests (Figure 1)."

Jung 2017 *(Continued)*

		Judgement comment: two dropouts in the experimental group, one in the control group
Selective reporting (reporting bias)	Low risk	Judgement comment: examiners presented significant and insignificant results. No study registration available
Other bias	Low risk	No other potential sources of bias found

Karthikbabu 2011

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to determine whether trunk exercises performed on a physio ball are more beneficial than those performed on a plinth in patients with acute stroke
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 59.8 ± 10.5 • Number of participants: 15 • Sex (women/men): 7/8 • Type of stroke event (I/H): 9/6 • Location of stroke event (L/R): 10/5 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in days: 11.8 ± 8.1 Control group (same amount of additional therapy) • Mean age and SD: 55 ± 6.5 • Number of participants: 15 • Sex (women/men): 6/9 • Type of stroke event (I/H): 8/7 • Location of stroke event (L/R): 9/6 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in days: 12.1 ± 7.5 **Inclusion criteria:** acute stroke patients who were medically stable and able to understand and follow simple verbal instructions were screened for eligibility for the study. Stroke diagnosis was confirmed by the neurologists on the basis of clinical examination, CT and MRI. Patients (mean post-stroke duration 12 (95% confidence interval (CI) 2 to 34) days) who had the first onset of unilateral supratentorial lesion associated with ischaemic or haemorrhagic stroke and could sit independently for 30 seconds on a stable surface, were included in the study. **Exclusion criteria:** patients were excluded if they had a neurological disease affecting balance other than a stroke, such as for instance a cerebellar disease, Parkinson's disease and/or a vestibular lesion; musculoskeletal disorders such as low backache, arthritis or degenerative diseases of the lower limbs affecting motor performance.

Karthikbabu 2011 *(Continued)*

Pretreatment: no significant differences between the groups were found for the demographic variables, stroke-related parameters and outcome measures at the pre-intervention level.

Sample size calculation: none

Interventions

Intervention characteristics

Experimental training

- Type of intervention: physio ball: all the patients received exercises consisting of task-specific movements of the upper and lower part of the trunk both in the supine and sitting positions. The supine exercises involved the pelvic bridge, the unilateral bridge, the flexion rotation of the upper and lower trunk. Sitting exercises included selective flexion extension of the lower trunk; lateral flexion of the upper and lower trunk; rotation of the upper and the lower trunk; weight shifts; forward and lateral reach. The intensity of the exercises was increased by introducing one or several of the following changes: (1) reducing the base of support; (2) increasing the lever arm; (3) advancing the balance limits; or (4) increasing the hold time.
- Length of intervention in minutes, days, or weeks: 3 weeks
- Total number of repetitions: 4 sessions/week, 3 weeks, 60 minutes each session
- Total minutes of intervention: 720
- Total minutes of conventional therapy: not reported
- Content of standard care: all the patients included in the study underwent regular acute-phase physiotherapy treatment,such as tone facilitation and a range of movement exercises for the hemiplegic side.
- Who provided study therapy: research physiotherapists
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): the number of repetitions and intensity of the exercise were determined by the physiotherapists based on the patient's performance. The exercises were performed with adequate rest periods in between. The intensity of the exercises was increased by introducing one or several of the following changes: (1) reducing the base of support; (2) increasing the lever arm; (3) advancing the balance limits; or (4) increasing the hold time.
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts, no adherence evaluated
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: physio ball
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: physio plinth: all the patients received exercises consisting of task-specific movements of the upper and lower part of the trunk both in the supine and sitting positions. The supine exercises involved the pelvic bridge, the unilateral bridge, the flexion rotation of the upper and lower trunk. Sitting exercises included selective flexion extension of the lower trunk; lateral flexion of the upper and lower trunk; rotation of the upper and the lower trunk; weight shifts; forward and lateral reach. The intensity of the exercises was increased by introducing one or several of the following changes: (1) reducing the base of support; (2) increasing the lever arm; (3) advancing the balance limits; or (4) increasing the hold time.
- Length of intervention in minutes, days, or weeks: 3 weeks
- Total number of repetitions: 4 sessions/week, 3 weeks, 60 minutes each session
- Total minutes of intervention: 720
- Total minutes of conventional therapy: not reported
- Content of standard care: all the patients included in the study underwent regular acute-phase physiotherapy treatment, such as tone facilitation and a range of movement exercises for the hemiplegic side.
- Who provided study therapy: research physiotherapists

Karthikbabu 2011 *(Continued)*

- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): the number of repetitions and intensity of the exercise were determined by the physiotherapists based on the patient's performance. The exercises were performed with adequate rest periods in between. The intensity of the exercises was increased by introducing one or several of the following changes: (1) reducing the base of support; (2) increasing the lever arm; (3) advancing the balance limits; or (4) increasing the hold time.
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts, no adherence evaluated
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: plinth
- Reporting of death and serious adverse events, including falls: not reported

Outcomes

Brunel Balance Assessment - stepping

- Outcome type: continuous outcome
- Range: 0-3
- Data value: change from baseline

Brunel Balance Assessment - standing

- Outcome type: continuous outcome
- Range: 0-6
- Data value: change from baseline

Trunk function

- Outcome type: continuous outcome
- Scale: TIS 1.0
- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Standing balance

- Outcome type: continuous outcome
- Scale: Brunel Balance Assessment total
- Direction: higher is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "block randomization" Judgement comment: it was not clear how large the randomisation blocks were.
Allocation concealment (selection bias)	Low risk	Quote: "The method of allocation was concealed in sequentially numbered, sealed, opaque envelopes. An independent observer who performed the randomization procedure was not involved in conducting interventions and collecting the outcome measures."

Karthikbabu 2011 *(Continued)*

Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not described by the study authors
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "An independent blinded observer who measured both the outcomes was not aware of the allocation of treatment groups."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "with no patient dropout in the intervention period."
Selective reporting (reporting bias)	Low risk	Judgement comment: no trial registration available; both significant and non-significant results were shown.
Other bias	Low risk	No other potential sources of bias found

Karthikbabu 2018a

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** the primary objective of the current study was to examine the effects of plinth and Swiss ball-based trunk exercise regimens to standard physiotherapy on trunk control, that is, dynamic sitting balance and co-ordination, balance capacity, mobility, physical function, and community reintegration in people with chronic stroke. The secondary objective was to compare the trunk regimens with each other in chronic stroke.
Participants	**Baseline characteristics** Experimental training (selective-trunk training) • Mean age and SD: 57.2 ± 11.5 • Number of participants: 36 • Sex (women/men): 11/25 • Type of stroke event (I/H): 24/12 • Location of stroke event (L/R): 15/21 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 12.6 ± 11.9 Experimental training (unstable-surface training) • Mean age and SD: 54 ± 14.1 • Number of participants: 36 • Sex (women/men): 10/26 • Type of stroke event (I/H): 20/16 • Location of stroke event (L/R): 17/19 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported

Karthikbabu 2018a *(Continued)*

- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 12.5 ± 14.2

Control group (same amount of additional therapy)

- Mean age and SD: 54.8 ± 12.5
- Number of participants: 36
- Sex (women/men): 13/23
- Type of stroke event (I/H): 21/15
- Location of stroke event (L/R): 16/20
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 14 ± 9.8

Inclusion criteria: people with unilateral supratentorial stroke lesion aged between 30 and 75 years; first onset of ischaemic or haemorrhagic stroke; ability to comprehend and to follow verbal instructions; Brunnstrom recovery stage beyond 3 for lower extremity; patients with poor trunk performance (TIS < 21); and independent walking ability to cross 10 m distance with or without a mobility aid

Exclusion criteria: The study exclusion criteria were as follows: patients with multiple stroke; pusher syndrome; neurologic disorders other than stroke that could potentially affect balance and ambulation;and those who could not tolerate treatment positions and exercise intensity because of diagnosed musculoskeletal dysfunction of lower extremity or trunk.

Pretreatment: baseline demographics and characteristics of study participants were similar at baseline.

Sample size calculation: none

Interventions	**Intervention characteristics** Experimental training (selective-trunk training) • Type of intervention: selective upper and lower trunk movements in supine and sitting positions using either stable support (i.e. plinth). Exercises in supine position involved the pelvic bridge, the unilateral bridge, and the upper and lower trunk initiated flexion-rotation movements. Exercises in sitting position included the selective movements of lower trunk flexion-extension; upper and lower trunk lateral flexion; the upper and lower trunk flexion-rotation; and forward and lateral reach-outs (data supplement). • Length of intervention in minutes, days, or weeks: 6 weeks • Total number of repetitions: 3 sessions/week, 6 weeks, 60 minutes/session • Total minutes of intervention: 1080 • Total minutes of conventional therapy: not reported • Content of standard care: not reported • Who provided study therapy: not reported • How provided (face-to-face, internet, telephone, individual, in group): face-to-face • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported • Modification (intervention was modified during the course of the study?): not reported • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported • Material used: plinth • Reporting of death and serious adverse events, including falls: "We did not observe any adverse events during and immediately after trunk exercise regimes."

Karthikbabu 2018a *(Continued)*

Experimental training (unstable-surface training)

- Type of intervention: selective upper and lower trunk movements in supine and sitting positions using either unstable support (i.e. Swiss ball). Exercises in supine position involved the pelvic bridge, the unilateral bridge, and the upper and lower trunk initiated flexion-rotation movements. Exercises in sitting position included the selective movements of lower trunk flexion-extension; upper and lower trunk lateral flexion; the upper and lower trunk flexion-rotation; and forward and lateral reach-outs (data supplement).
- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 3 sessions/week, 6 weeks, 60 minutes/session
- Total minutes of intervention: 1080
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: Swiss ball
- Reporting of death and serious adverse events, including falls: "We did not observe any adverse events during and immediately after trunk exercise regimes."

Control group (same amount of additional therapy)

- Type of intervention: patients in the control group practised standard physiotherapy treatment such as tone inhibitory, muscle elongation, and muscle activity exercises for paralysed lower limb. They were also given supervised balance exercises and walking training.
- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 3 sessions/week, 6 weeks, 60 minutes/session
- Total minutes of intervention: 1080
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: "We did not observe any adverse events during and immediately after trunk exercise regimes."

Outcomes	Tinetti balance

- Outcome type: continuous outcome
- Range: 0-12
- Direction: higher is better
- Data value: change from baseline

Karthikbabu 2018a *(Continued)*

Tinetti gait

- Outcome type: continuous outcome
- Range: 0-16
- Direction: higher is better
- Data value: change from baseline

Tinetti total

- Outcome type: continuous outcome
- Range: 0-28
- Direction: higher is better
- Data value: change from baseline

Trunk function

- Outcome type: continuous outcome
- Scale: TIS 2.0
- Range: 0-16
- Direction: higher is better
- Data value: change from baseline

Quality of life

- Outcome type: continuous outcome
- Scale: Stroke Impact Scale 2.0
- Range: 0-100
- Direction: higher is better
- Data value: change from baseline

Walking ability

- Outcome type: continuous outcome
- Scale: walking speed
- Unit of measure: m/s
- Direction: higher is better
- Data value: change from baseline

Standing balance

- Outcome type: continuous outcome
- Scale: Tinetti balance
- Direction: higher is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "The included participants were then randomly assigned to receive any of the 3 interventions by block randomization." Judgement comment: size of the block was unknown so a future randomisation could not be done in the exact same way.

Karthikbabu 2018a *(Continued)*

Allocation concealment (selection bias)	Low risk	Quote: "The process of allocation was concealed in sealed envelopes numbered in sequences."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not described if personnel or participants were blinded
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not described if assessor was blinded or not
Incomplete outcome data (attrition bias) All outcomes	High risk	Judgement comment: there was a high dropout percentage; more than 16% per group stopped the intervention. The reasons for dropout were well described and searched for the different groups.
Selective reporting (reporting bias)	High risk	Judgement comment: trial registration was available; Activity Balance Confidence (ABC) scale was not reported in this article.
Other bias	Low risk	No other potential sources of bias found

Karthikbabu 2021

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to examine the effects of core-stability exercises on stable and unstable support surfaces on trunk control, strength, standing weight-bearing symmetry, and balance confidence in people with chronic stroke. The secondary objective was to investigate whether core-stability exercises on an unstable support surface would be better than a stable support surface in patients with chronic stroke. We hypothesised that core-stability exercises on stable and unstable support surfaces are superior to standard physiotherapy in improving the measures mentioned above.
Participants	**Baseline characteristics** Experimental training (core stability) • Mean age and SD: 56.9 ± 12.1 • Number of participants: 28 • Sex (women/men): 9/19 • Type of stroke event (I/H): 17/11 • Location of stroke event (L/R): 10/18 • Stroke severity at baseline, by means of Brunnstrom's lower limb motor recovery: 4 ± 0.6 • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 13.2 ± 12.9 Experimental training (unstable-surface training) • Mean age and SD: 53.4 ± 13.9 • Number of participants: 28 • Sex (women/men): 8/4 • Type of stroke event (I/H): 6/6

Karthikbabu 2021 *(Continued)*

- Location of stroke event (L/R): 3/9
- Stroke severity at baseline, by means of Brunnstrom's lower limb motor recovery: 3.6 ± 0.7
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 13.1 ± 15.7

Control group (same amount of additional therapy)

- Mean age and SD: 54.6 ± 12.7
- Number of participants: 28
- Sex (women/men): 5/5
- Type of stroke event (I/H): 5/5
- Location of stroke event (L/R): 2/8
- Stroke severity at baseline, by means of Brunnstrom's lower limb motor recovery: 3.7 ± 0.6
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 14.8 ± 10.9

Inclusion criteria: first onset of cortical and subcortical stroke, a minimum of 6 months post-stroke duration, haemorrhagic or ischaemic vascular lesion of middle cerebral artery territory, both genders, individuals aged 30–75 years, ability to follow simple oral instructions, scoring < 20 points out of 23 on TIS, and independent walking capacity for a distance of 10 metres with or without using walking aids

Exclusion criteria: infratentorial stroke lesions, severe visual impairment, Pusher syndrome, and conditions other than stroke resulting in balance and walking issues

Pretreatment: continuous and nominal variables of the participants at baseline were similar, and there was no statistical significance (P > 0.05) between the groups.

Sample size calculation: mean change of four points in the TIS or five-pound gain (effect size of 0.5) in trunk muscle strength following core-stability training was a clinically relevant change in people with chronic stroke. With a power rate of 80% (1-β) and a significance level of 5% (α = 0.05), this study needed 28 patients in each group, a total of 84 individuals considering 10% dropout at follow-up and uncertainty in the power calculation.

Interventions

Intervention Characteristics

Experimental training (core stability)

- Type of intervention: core-stability training on a stable support surface + 15 minutes of gait training. The patient practiced the pelvic bridge in the crook-lying position by moving the pelvis off the plinth initially with arms at the side and then flexing the healthy upper limb. Unilateral pelvic bridge exercise was practiced by flexing the lower extremity off from the plinth while keeping the pelvis dynamically stable. The patient performed the selective upper trunk rotation while stabilising the lower body with hips in abduction. The patient initially rotated the upper body by bringing the clasped hands towards more and less involved sides and then performed upper trunk flexion-rotation by clearing the opposite side scapula. In the crook-lying position, the lower trunk rotation was executed by moving the knees on both sides. The lower trunk flexion-rotation was achieved by bringing the knees diagonally towards the shoulder. The patient performed selective ante-flexion and retro-flexion of the trunk at the lumbar region in a seated position. Lateral flexion of the upper and lower trunk was selectively executed by bringing the elbow towards the plinth, lifting the pelvis towards the thoracic cage in a seated position, and progressed to cross-legged sitting. Rotation of the upper and lower trunk was executed by bringing both the shoulders and knees into the anterior-posterior direction, respectively. Forward and diagonal reach-outs were performed by forward flexing the trunk at the hips so that the patient reached a fixed point at shoulder height. During sideways arm reach-out, the patient actively elongated the weight-bearing side of the trunk.
- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 3 sessions/week, 6 weeks, 60 minutes/session

Karthikbabu 2021 *(Continued)*

- Total minutes of intervention: 1080
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): individual
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): one dropout (3%)
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not evaluated
- Material used: plinth
- Reporting of death and serious adverse events, including falls: not reported

Experimental training (unstable trunk training)

- Type of intervention: core-stability training on an unstable support surface. The patient performed pelvic bridge placing the lower limbs on unstable support surface and lifted the pelvis from the bed. The patient flexed the healthy lower limb off the ball to achieve the unilateral pelvic bridge while stabilising the pelvis. The patient performed the lower trunk rotation by flexing his knees on the ball and then moving it to either side. The lower trunk flexion-rotation movement was done by bringing the knees (stabilised the ball) diagonally towards the chest. Keeping the ball stable with 90°to –90° hips and knees flexion, the patient touched the knee with a clasped hand to perform the upper trunk flexion-rotation. The therapist applied tactile cues and controlled the ball's movement until the patient gained balance confidence and independently stabilised it. Subsequently, the therapist slowly let go of the ball and took hands off the patient. Selective movement of the lower trunk flexion-extension in sitting was executed by allowing the ball to roll in anterior and posterior directions until it touched the plantar flexor muscles, thus permitting the lumbar spine to curve-arch. Upper and lower trunk lateral flexion was practiced by bringing the elbow towards the ball and lifting the pelvis towards the thoracic cage. The exercises, such as elevating the sound arm over the head, flexing the strong leg at the hip, and tapping the foot on the floor, shifted the centre of mass towards the more affected side. The patient performed sideways, forward, and diagonal arm reach-outs at shoulder height by active elongation and forward inclination of the trunk. The patient performed upper and lower trunk rotation by performing each knee and shoulder forwards and backwards while seated on a ball.
- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 3 sessions/week, 6 weeks, 60 minutes/session
- Total minutes of intervention: 1080
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): individual
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): one dropout (3%)
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not evaluated
- Material used: ball
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: individualised standard physiotherapy such as tone modulation exercises, balance exercises, stretching, and strengthening of lower limb muscles + 15 minutes of gait training
- Length of intervention in minutes, days, or weeks: 6 weeks

Karthikbabu 2021 *(Continued)*

- Total number of repetitions: 3 sessions/week, 6 weeks, 60 minutes/session
- Total minutes of intervention: 1080
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): individual
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): one dropout (3%)
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not evaluated
- Material used: none
- Reporting of death and serious adverse events, including falls: not reported

Outcomes	Trunk function • Outcome type: continuous outcome • Scale: TIS 1.0 • Range: 0-23 • Direction: higher is better • Data value: change from baseline
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Following eligibility screening, the patients with stroke were allocated to one of the three intervention arms. Of the 16 blocks, each block contained six randomly ordered intervention assignments (two each for stable support, unstable support core-stability regimens, and control group respectively)."
Allocation concealment (selection bias)	Low risk	Quote: "The order of allocation to treatment groups was concealed in sealed opaque envelopes. The observer unsealed envelopes in front of the patient who met the study eligibility and was assigned the respective exercise training."
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "We had a consensus meeting among the therapists and cleared the doubts and discrepancies."
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Judgement comment: it was indicated that the assessor was blind but more details were not available about the nature of the blinding.
Incomplete outcome data (attrition bias) All outcomes	Low risk	Judgement comment: in each group, 1 person did not do the post-measurement moments. This corresponds to 3% per group. The reasons for dropouts were also described.
Selective reporting (reporting bias)	High risk	Judgement comment: study registration was available. Some outcome measures reported in the study registrations were not reported in the manuscript

Karthikbabu 2021 *(Continued)*

		(Reintegration to Normal Living Index (RNLI), Stroke Impact Scale-16 (SIS-16), Performance Oriented Mobility Assessment).
Other bias	Low risk	—

Kilinç 2016

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to investigate the effects of the individually designed Bobath-based trunk training on trunk control, functional skills, walking, and balance in stroke patients. In this study, the main aim was to eliminate individual trunk impairments affecting various functions performed by patients.
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 55.91 ± 7.92 • Number of participants: 12 • Sex (women/men): 8/4 • Type of stroke event (I/H): 6/6 • Location of stroke event (L/R): 3/9 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 58.66 ± 55.68 Control group (same amount of additional therapy) • Mean age and SD: 54 ± 13.64 • Number of participants: 10 • Sex (women/men): 5/5 • Type of stroke event (I/H): 5/5 • Location of stroke event (L/R): 2/8 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: not reported **Inclusion criteria:** patients in the subacute and chronic stages associated with stroke hemiparesis (time since stroke onset < 6 months), patients with an affected trunk (those who did not have full points in the TIS), adults 18 years or older, patients who could sit and walk independently (or those who used an aid for walking) **Exclusion criteria:** (1) patients with recurrent strokes; (2) patients with communication problems; (3) patients with orthopaedic or neurological disorders (other than strokes) that might affect their motor performance **Pretreatment:** at the beginning of the study, the demographic and clinical characteristics of the patients (Berg Balance Test, TUG, 10 m walking test, FR, TIS, and STREAM) were similar in the two groups (P > 0.05)

Kilinç 2016 *(Continued)*

	Sample size calculation: not calculated
Interventions	**Intervention characteristics** Experimental training • Type of intervention: the treatment programme was developed taking the functional limitations of the patients into account, and consisted of seven trunk exercises according to the Bobath concept. These were: 1. stretching of the latissimus dorsi muscle; 2. functional use and strengthening of the latissimus dorsi; 3. functional strengthening of abdominal and oblique abdominal muscles; 4. placing exercises in order to facilitate trunk extension; 5. rotations and counter-rotations (right and left) of the hips with the trunk extended; 6. training of lumbar spine stabilisers; 7. functional reach of shoulder, anterior, right, and left sides • Length of intervention in minutes, days, or weeks: 12 weeks • Total number of repetitions: 3 sessions/week, 12 weeks, 60 minutes/session • Total minutes of intervention: 2160 • Total minutes of conventional therapy: not reported • Content of standard care: not reported • Who provided study therapy: Bobath-trained physiotherapist • How provided (face-to-face, internet, telephone, individual, in group): face-to-face • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): the treatment programme was developed taking the functional limitations of the patients into account • Modification (intervention was modified during the course of the study?): not reported • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 2 dropouts, the researchers increased the number in this group. • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported • Material used: none • Reporting of death and serious adverse events, including falls: not reported Control group (same amount of additional therapy) • Type of intervention: strengthening (trunk flexion–extension) and stretching exercises (stretching and elongation), mat activities (bridging), functional activities (weight transfer to from anterior to posterior and left to right), and range of motion exercises (trunk flexion, extension, left–right rotation, lateral flexion) • Length of intervention in minutes, days, or weeks: 12 weeks • Total number of repetitions: 3 sessions/week, 12 weeks, 60 minutes/session • Total minutes of intervention: 2160 • Total minutes of conventional therapy: not reported • Content of standard care: not reported • Who provided study therapy: Bobath-trained physiotherapist • How provided (face-to-face, internet, telephone, individual, in group): face-to-face • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported • Modification (intervention was modified during the course of the study?): not reported • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 1 dropout • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported • Material used: none • Reporting of death and serious adverse events, including falls: not reported
Outcomes	Get up and Go

Kilinç 2016 *(Continued)*

- Outcome type: continuous outcome
- Direction: lower is better
- Data value: change from baseline

Trunk function

- Outcome type: continuous outcome
- Scale: TIS 1.0
- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Standing balance

- Outcome type: continuous outcome
- Scale: Berg Balance Scale
- Range: 0-56
- Direction: higher is better
- Data value: change from baseline

Walking ability

- Outcome type: continuous outcome
- Scale: 10 metre walk test
- Direction: lower is better
- Data value: change from baseline

Leg function

- Outcome type: continuous outcome
- Scale: Stream-lower extremity
- Direction: higher is better
- Data value: change from baseline

Arm-hand activity

- Outcome type: continuous outcome
- Scale: Stream-upper extremity
- Direction: higher is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "After the initial assessment, patients were divided randomly into two groups using a random numbers table. One of the authors (EA) made the randomization by using a computer-generated random number. Blocks were numbered, and then a random-number generator program was used to select numbers that established the sequence in which blocks were allocated to study or the control group".
Allocation concealment (selection bias)	Unclear risk	Not described by the study authors

Kilinç 2016 *(Continued)*

Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not blinded
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Assessor-blinded randomised controlled trial
Incomplete outcome data (attrition bias) All outcomes	High risk	The experimental group had a high percentage (2) of dropouts compared to the control population (1).
Selective reporting (reporting bias)	Low risk	No trial registration available; both significant and non-significant results were shown.
Other bias	Low risk	No other potential sources of bias found

Kim 2011

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to investigate the effects of trunk stabilising exercises using the stabilising reversal (SR) and rhythmic stabilisation (RS) of PNF on the FRT and lower extremity muscle activity of stroke patients
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 51.4 ± 5.7 • Number of participants: 20 • Sex (women/men): 3/17 • Type of stroke event (I/H): 12/8 • Location of stroke event (L/R): 12/8 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 22.9 ± 12.2 Control group (same amount of additional therapy) • Mean age and SD: 53.5 ± 7.1 • Number of participants: 20 • Sex (women/men): 6/14 • Type of stroke event (I/H): 11/9 • Location of stroke event (L/R): 12/8 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 26.8 ± 12.8

Kim 2011 *(Continued)*

Inclusion criteria: patients diagnosed with stroke who could walk by themselves without being helped by others or could walk at least 10 m using a walking aid, scored at least 24 points in the MMSE-K, had spasticity of grade 2 or lower in the affected lower extremity as evaluated by the Modified Ashworth Scale, had no orthopaedic problem that could affect the treatment, and could receive training for 30 minutes or longer

Exclusion criteria: not reported

Pretreatment: no significant difference between the experimental group and the control group before the intervention was found ($P > 0.05$), but significant differences after the intervention were shown ($P < 0.05$).

Sample size calculation: not calculated

Interventions

Intervention characteristics

Experimental training

- Type of intervention: PNF using stabilising reversal and rhythmic stabilisation. Stabilising reversal is alternating muscle contraction which aims to stabilise a person with a static command. Due to the changing of grip, a small movement is allowed. One method of applying stabilising reversal is to start in the strong direction with resistance and approximation and ask the patient to stay in that position and add resistance in all three directions of the pattern. When the patient is properly responding to the therapist's resistance, the therapist moves one hand to the opposite direction and then asks the patient to resist the new direction and the therapist changes his other hand. Rhythmic stabilisation, also known as alternating isometrics, is alternating isometric contraction against resistance. No motion by the patient should occur and no relaxation between the changes of muscle contractions. With this technique, the therapist resists a static contraction and the patient maintains the same position. The resistance is increased slowly and when the patient resists strongly, the therapist changes his hands to control the opposite direction. The new resistance is built up slowly and the therapist prepares the next change again. Stabilising reversal and rhythmic stabilisation were performed with correct techniques in both the sitting and standing positions.
- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 5 sessions/week, 6 weeks, 10 minutes per session
- Total minutes of intervention: 300
- Total minutes of conventional therapy: 5 sessions/week, 6 weeks, 20 minutes per session = 600 minutes
- Content of standard care: the general therapeutic exercise was composed of stretching exercises and exercises for the range of motion of joints. The PNF provided to the experimental group was implemented after the exercise programmes were explained and demonstrated by professionally trained therapists so that the participants would sufficiently understand the exercise programmes.
- Who provided study therapy: professionally trained therapists
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: no extra material used
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: the control group received only general therapy
- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 5 sessions/week, 6 weeks, 10 minutes per session
- Total minutes of intervention: 300

Kim 2011 *(Continued)*

- Total minutes of conventional therapy: 5 sessions/week, 6 weeks, 20 minutes per session = 600 minutes
- Content of standard care: the general therapeutic exercise was composed of stretching exercises and exercises for the range of motion of joints
- Who provided study therapy: professionally trained therapists
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: no extra material used
- Reporting of death and serious adverse events, including falls: not reported

Outcomes	Standing balance • Outcome type: continuous outcome • Scale: functional reach in standing (cm) • Direction: higher is better • Data value: change from baseline
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "randomly assigned to a trunk stability exercise using PNF group" Judgement comment: too vague
Allocation concealment (selection bias)	Unclear risk	Judgement comment: no explanation for the allocation concealment
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not described if participants or personnel were blinded
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not described if assessor was blinded
Incomplete outcome data (attrition bias) All outcomes	High risk	Study authors did not report if there were any dropouts or the possible reasons
Selective reporting (reporting bias)	Low risk	Judgement comment: no trial registration available; both significant and non-significant results were shown.
Other bias	Unclear risk	Not clear if any other forms of biases were reduced

Ko 2016

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to investigate the additive effects of core muscle strengthening and trunk neuromuscular electrical stimulation on trunk balance in stroke patients
Participants	**Baseline characteristics** Experimental training (core-stability training + same amount of additional therapy) • Mean age and interquartile range: 59.5 (53.5 to 71.5) • Number of participants: 10 (completers) • Sex (women/men): 2/8 • Type of stroke event (I/H): 8/2 • Location of stroke event (L/R): 5/5 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and interquartile range after stroke in days: 12 (8 to 14.3) Experimental training (electrostimulation + same amount of additional therapy 2) • Mean age and interquartile range: 65.5 (49.8 to 69) • Number of participants: 10 (completers) • Sex (women/men): 6/4 • Type of stroke event (I/H): 9/1 • Location of stroke event (L/R): 6/4 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and interquartile range after stroke in days: 8.5 (8 to 13.3) Experimental training (core-stability training + electrostimulation) • Mean age and interquartile range: 58.5 (45.5 to 72.5) • Number of participants: 10 (completers) • Sex (women/men): 3/7 • Type of stroke event (I/H): 9/1 • Location of stroke event (L/R): 4/6 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and interquartile range after stroke in days: 11 (8.5 to 13) **Inclusion criteria:** patients with a first stroke of hemiparesis within 1 month of onset, and who could not maintain static sitting balance for more than 5 minutes were enrolled. **Exclusion criteria:** 1) people who could not communicate with therapists as a consequence of severe aphasia or cognitive impairment, 2) people who were paralysed on both sides, 3) people who were suffering from other neurological diseases, 4) people with neglect, 5) people with vestibular organ diseases, 6) people with severe internal diseases or back pain, and 7) people with implanted pacemakers or defibrillators

Ko 2016 *(Continued)*

Pretreatment: patient baseline characteristics were well balanced among the 3 groups.

Sample size calculation: not calculated

Interventions

Intervention characteristics

Experimental training (core-stability training + same amount of additional therapy)

- Type of intervention: Core Muscle Strengthening (CMS) programme. The CMS programme focused on trunk muscle strengthening, selective movements of the trunk muscle, and co-ordination, and was carried out in supine, prone, and lateral positions. In a supine position, patients were told to bend their legs, rest their feet on the treatment table, keep their back in a neutral position and tighten their abdominal muscles. The exercises included lifting their pelvis with both feet supported (the bridge exercise), tilting both knees slowly to the left and right sides as far as possible (segmental rotation), and raising both legs and arms off the floor and towards the ceiling before lowering one arm and the opposite leg simultaneously and then repeating for the other side (the dead bug exercise). Prone position exercises included maintaining a push-up position with the body weight borne on the forearms, elbow, and toes (plank exercise), pushing hips up while keeping the back straight from a plank position and tightening the abdominal muscles (belly blaster), and kneeling on the floor with hands placed approximately shoulder width apart before lifting one hand and the opposite knee (bird dog exercise). In a lateral position, exercises consisted of lying on one side, balancing on a forearm and foot to form a diagonal line while maintaining shoulders, hips, and knees in alignment and tightening the abdominal muscles (side plank exercise), and lifting and lowering the opposite leg (side bridge exercise). Exercises were introduced gradually and the progression and number of repetitions were based on the level of performances for each patient. Therefore, some patients only repeated low-level exercises, while some progressed to more difficult exercises. Trunk exercises were initiated with moderate assistance and progressed to a state requiring no assistance. Patients who did not have sufficient muscle strength to control themselves were assisted by their therapists during exercises.
- Length of intervention in minutes, days, or weeks: 3 weeks
- Total number of repetitions: 3 sessions/week, 3 weeks, 20 minutes each session
- Total minutes of intervention: 180
- Total minutes of conventional therapy: not reported
- Content of standard care: the standard rehabilitation programme consisting of physiotherapy and occupational therapy, including a range of movement exercises, tone facilitation, strengthening, balancing, ADL training, and ordinary postural control exercises, such as standing, shifting of weight loads between the non-paralytic and paralytic sides of the foot, and gait. Cognitive therapy and speech therapy were provided if needed.
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): exercises were introduced gradually and the progression and number of repetitions were based on the level of performances for each patient. Therefore, some patients only repeated low-level exercises, while some progressed to more difficult exercises. Trunk exercises were initiated with moderate assistance and progressed to a state requiring no assistance.
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 2 dropouts out of 12
- How well? (If intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not evaluated
- Material used: electrical stimulation (Novastim CU-FS1; CU Medical Systems Inc, Wonju, Korea)
- Reporting of death and serious adverse events, including falls: not reported

Experimental training (electrostimulation + same amount of additional therapy 2)

- Type of intervention: additional tNMES over the posterior back muscles. For the tNMES group, we used 4 channel electrodes, and attached them to the thoracic erector spinae (5 cm lateral to the T6 spinous process), and lumbar erector spinae (2 cm lateral to the L5 spinous process) as shown in Fig. 2. Electrical stimulation (Novastim CU-FS1; CU Medical Systems Inc., Wonju, Korea) was applied at 30–70 mA intensity, 250 ms pulse width, and 35 Hz frequency for 10 seconds followed by a pause for 12

Ko 2016 *(Continued)*

seconds. The intensity of stimulation was set to the maximum amount at which patients could feel muscle contraction without pain sensation or tiredness. Patients were told to maintain a sitting position as independently as possible.

- Length of intervention in minutes, days, or weeks: 3 weeks
- Total number of repetitions: 3 sessions/week, 3 weeks, 20 minutes each session
- Total minutes of intervention: 180
- Total minutes of conventional therapy: not reported
- Content of standard care: the standard rehabilitation programme consisting of physiotherapy and occupational therapy, including a range of movement exercises, tone facilitation, strengthening, balancing, ADL training, and ordinary postural control exercises, such as standing, shifting of weight loads between the non-paralytic and paralytic sides of the foot, and gait. Cognitive therapy and speech therapy were provided if needed.
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was planned to be personalised, titrated or adapted? What and how?): none
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 1 dropout out of 11
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not evaluated
- Material used: electrical stimulation (Novastim CU-FS1; CUMedical Systems Inc, Wonju, Korea)
- Reporting of death and serious adverse events, including falls: not reported

Experimental training (core-stability training + electrostimulation)

- Type of intervention: combination of the core muscle strengthening training and the electrostimulation. Participants received the CMS programme with tNMES while on their back
- Length of intervention in minutes, days, or weeks: 3 weeks
- Total number of repetitions: 3 sessions/week, 3 weeks, 20 minutes each session
- Total minutes of intervention: 180
- Total minutes of conventional therapy: not reported
- Content of standard care: the standard rehabilitation programme consisting of physiotherapy and occupational therapy, including a range of movement exercises, tone facilitation, strengthening, balancing, ADL training, and ordinary postural control exercises, such as standing, shifting of weight loads between the non-paralytic and paralytic sides of the foot, and gait. Cognitive therapy and speech therapy were provided if needed.
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): none
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 1 dropout out of 11
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not evaluated
- Material used: Electrical stimulation (Novastim CU-FS1; CUMedical Systems Inc, Wonju, Korea)
- Reporting of death and serious adverse events, including falls: not reported

Outcomes	Standing balance

- Outcome type: continuous outcome
- Scale: Berg Balance Scale
- Range: 0-56
- Direction: higher is better
- Data value: change from baseline

Ko 2016 *(Continued)*

	Trunk function • Outcome type: continuous outcome • Scale: TIS 1.0 • Range: 0-23 • Direction: higher is better • Data value: change from baseline Activities of daily living • Outcome type: continuous outcome • Scale: modified Barthel Index • Direction: higher is better • Data value: change from baseline
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "On the day of recruitment, patients were randomly assigned to 1 of 3 groups using a random table: the CMS group (n = 12), the tNMES group (n = 11), or the combination (CMS and tNMES) group (n = 11)."
Allocation concealment (selection bias)	Unclear risk	Allocation was not clearly described.
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "all participating patients were aware of the treatment allocation in the study design."
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "However, the 2 fixed therapists were involved in patient evaluation but not treatment, and 3 investigators who conducted the study, were blinded to the treatment allocation."
Incomplete outcome data (attrition bias) All outcomes	High risk	Not clear in the details for this trial
Selective reporting (reporting bias)	Unclear risk	Not clear in the details for this trial
Other bias	Unclear risk	Not clear if any other forms of biases were reduced to permit 'low risk' or 'high risk'

Kumar 2011

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to investigate the effect of additional trunk exercises on sitting balance after stroke
Participants	**Baseline characteristics**

Kumar 2011 *(Continued)*

Experimental training

- Mean age and SD: 59.5 ± 12.09
- Number of participants: 10
- Sex (women/men): 5/5
- Type of stroke event (I/H): not reported
- Location of stroke event (L/R): 3/7
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in days: 15.0 ± 6.16

Control group (no additional therapy)

- Mean age and SD: 57.8 ± 13.49
- Number of participants: 10
- Sex (women/men): 3/7
- Type of stroke event (I/H): not reported
- Location of stroke event (L/R): 6/4
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in days: 15.8 ± 10.69

Inclusion criteria: 1) first onset of unilateral supratentorial stroke (ischaemic or haemorrhagic) who are stable and referred by physician for rehabilitation, 2) post-stroke duration less than 1 month duration, 3) MMSE score ≥ 24, 4) patient can able to sit unsupported on a bed with their feet touching the ground for 30 seconds

Exclusion criteria: 1) 70 years of age or older, 2) patients who were not able to understand the instructions, 3) patients with non-stroke-related sensory or motor impairments which affected their motor performance

Pretreatment: there were no statistically significant differences between groups for age, stroke onset, sex, and hemiparetic side.

Sample size calculation: not calculated in this study

Interventions

Intervention characteristics

Experimental training

- Type of intervention: supine exercises: 1) Bridging: this is done with the legs bent and the feet resting on the mat, included selective anterior-posterior movements of the pelvis and extension of the hips. The weight-bearing is at the shoulders and the feet. 2) Unilateral pelvic bridging: done with one foot resting on the mat and lifting the pelvis of the mat with the other leg raised in the air for about 60 degree of hip flexion and with knee in extension. weight-bearing is on the shoulder and on the foot of the leg which is placed on the mat. 3) Trunk rotations: Upper trunk rotation: the participant is in crook lying and is asked to rotate the upper trunk with the two hands clasped together around his chest. Lower trunk rotation: the participant is in crook lying and is asked to rotate his lower trunk by turning his knees to either sides. And is progressed by asking the participant to flex his hips and knees and bring the knees to the opposite shoulder. Sitting exercises: 1) Static sitting balance: the participant is made to sit with his hips and knees in 90 degree flexion position, and then his body alignment is corrected by giving verbal feedback to maintain proper position. 2) Trunk flexion: the participant flexes and extends the trunk without moving the trunk forwards or backwards (i.e. slouch to straight). Flexion and extension of the lumbar part of the spine: this involves selective anteflexion and retroflexion of the lower part of the trunk. 3) Trunk lateral flexion: lateral flexion of the trunk initiated from the shoulder

Kumar 2011 *(Continued)*

and pelvic girdle (from the shoulder girdle means that the patient touches the exercise table with one elbow and returns to the starting position; from the pelvic girdle means that the patient lifts one side of the pelvis and returns to the starting position). 4) Trunk rotations: Upper Trunk Rotation: the participant clasps his hands around his chest moves each shoulder forwards and backwards alternatively keeping his lower trunk stable. Lower Trunk Rotation: the participant while sitting in the upright position, maintaining his upper trunk erect, moves each knee forwards and backwards alternatively. 5) Weight shifts: participant shifts the weight from one side to the other both in anteroposterior and mediolateral directions i.e. moves forwards and backwards and side to side on the mat. 6) Forward reach: participant in sitting position attempts to reach destined object by forward flexing the trunk. 7) Lateral reach: participant attempts to reach a destined object by lateral flexing his trunk to both sides. 8) Perturbations: participant while in sitting position on mat, is given perturbations in all directions.

- Length of intervention in minutes, days, or weeks: 3 weeks
- Total number of repetitions: 6 sessions/week, 3 weeks, 45 minutes each session
- Total minutes of intervention: 810
- Total minutes of conventional therapy: not reported
- Content of standard care: conventional multidisciplinary stroke rehabilitation programme. This programme is patient-specific with main emphasis on the neurodevelopmental concept and on motor relearning strategies.
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): exercises were gradually introduced and the progression of the exercise was determined based on patient‘s performance and by increasing the repetitions and hold time of the exercises.
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 6 dropouts of 26 participants
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: training mat, exercise table, destined object
- Reporting of death and serious adverse events, including falls: not reported.

Control group (no additional therapy)

- Type of intervention: not reported
- Length of intervention in minutes, days, or weeks: not reported
- Total number of repetitions: not reported
- Total minutes of intervention: not reported
- Total minutes of conventional therapy: not reported
- Content of standard care: this programme is patient-specific with main emphasis on the neurodevelopmental concept and on motor relearning strategies.
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported.

Outcomes	Trunk function • Outcome type: continuous outcome • Scale: TIS 1.0

Kumar 2011 *(Continued)*

- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Standing balance

- Outcome type: continuous outcome
- Scale: Brunel Balance Assessment total
- Direction: higher is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "randomized into an experimental or control group by block randomization. 5 blocks made with 4 subjects in each block were made to ensure equal number of participants in both groups."
Allocation concealment (selection bias)	Unclear risk	Not clearly described if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	High risk	No blinding
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "To reduce bias, pre and post outcome measures were collected by the blinded assessor who was blinded to group allocation."
Incomplete outcome data (attrition bias) All outcomes	High risk	Quote: "with 6 dropouts because of early discharge, recurrent stroke and musculoskeletal complaints," Judgement comment: 6 of the 26 candidates dropped out of the study. It was not clear to which group these participants belonged.
Selective reporting (reporting bias)	Unclear risk	Judgement comment: no study registration available; only positive results were shown.
Other bias	Low risk	No other potential sources of bias found

Lee 2012

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to see if training in the sitting position together with balance training, based on dual motor task training at the same time, is effective at enhancing trunk control ability and dynamic balance ability in sitting position
Participants	**Baseline characteristics** Experimental training (unstable-surface training)

Lee 2012 *(Continued)*

- Mean age and SD: 59.0 ± 11.0
- Number of participants: 14
- Sex (women/men): 6/8
- Type of stroke event (I/H): not reported
- Location of stroke event (L/R): 6/8
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 34.4 ± 25.4

Control group

- Mean age and SD: 62.3 ± 14.2
- Number of participants: 14
- Sex (women/men): 4/10
- Type of stroke event (I/H): not reported
- Location of stroke event (L/R): 8/6
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 33.6 ± 15.9

Overall

- Mean age and SD: not reported
- Number of participants: not reported
- Sex (women/men): not reported
- Type of stroke event (I/H): not reported
- Location of stroke event (L/R): not reported
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: not reported

Inclusion criteria: more than a year from stroke onset, a score of more than 24 out of 30 points in the MMSE-K, and ability to sit independently on an unstable disc for longer than 30 seconds

Excluded criteria: all participants provided their written informed consent prior to participation in this study.

Pretreatment: there were no differences between the 2 groups in the demographic variables, stroke-related parameters or the pre-intervention outcome measures.

Sample size calculation: not calculated

Interventions	**Intervention characteristics** Experimental training (unstable-surface training) • Type of intervention: the dual motor-task training group performed 5 minutes of warm-up exercise before the start of training such as raising the upper extremities, trunk flexion and rotation for range of motion and flexibility. The therapist supported the patients if they could not perform the movements actively. The dual motor-task training was performed using the upper extremities while sitting on unstable ground to stimulate active balance. A 50 cm diameter disk was used as unstable ground. Participants sat on the disk with their knee and hip joints flexed at 90° and with their feet touching

Lee 2012 *(Continued)*

the ground. The training was administered in three steps, 2 weeks for each step, for a total of 6 weeks to motivate patients. Patients moved a cup forward and from the coronal plane to the diagonal side while keeping balance in the sitting position on unstable ground for the first step. For the second step, patients performed targeting with a ball and tossing a balloon. In the third step, patients did fishing and played badminton while keeping balance in the sitting position on unstable ground. Each step was performed for 12 minutes and one minute of resting time was given between each step.

- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 3 sessions/week, 6 weeks, 30 minutes per session
- Total minutes of intervention: 540
- Total minutes of conventional therapy: 5 sessions/week, 6 weeks, 60 minutes per session = 1800 minutes
- Content of standard care: the physical and occupational therapists carried out the general exercise programme which consisted of Brunnstrom motion therapy, Bobath neurological development therapy, and proprioceptive neuromuscular facilitation. The physical therapist spent 10 minutes each conducting: flexibility training, resistance exercise for muscle strengthening, and pelvic tilting exercise focused on trunk control ability. The occupational therapist carried out activities of daily living training focused on functional activities for 30 minutes.
- Who provided study therapy: therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face, in a separate place from the control group
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): the therapist supported the patients if they could not perform the movements actively.
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 1 dropout due to discharge
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): no
- Material used: 50cm diameter disk, a cup, ball, balloon
- Reporting of death and serious adverse events, including falls: not reported

Control group

- Type of intervention: not reported
- Length of intervention in minutes, days, or weeks: not reported
- Total number of repetitions: not reported
- Total minutes of intervention: not reported
- Total minutes of conventional therapy: 1800
- Content of standard care: the physical and occupational therapists carried out the general exercise programme which consisted of Brunnstrom motion therapy, Bobath neurological development therapy, and proprioceptive neuromuscular facilitation. The physical therapist spent 10 minutes each conducting: flexibility training, resistance exercise for muscle strengthening, and pelvic tilting exercise focused on trunk control ability. The occupational therapist carried out activities of daily living training focused on functional activities for 30 minutes
- Who provided study therapy: physical therapist
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 1 dropout due to discharge
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes	Trunk impairment scale 1.0

Lee 2012 *(Continued)*

- Outcome type: continuous outcome
- Scale: TIS
- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Modified Functional Reach Test-Anterior reach (cm)

- Outcome type: continuous outcome
- Direction: higher is better
- Data value: change from baseline

Trunk function

- Outcome type: continuous outcome
- Scale: TIS 1.0
- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Subjects were randomly allocated to one of two groups: the dual motor task training group and the control group." Judgement comment: there were no details available that described the randomisation process nor how the allocation remained unpredictable.
Allocation concealment (selection bias)	Unclear risk	Judgement comment: there were no details available that described the randomisation process nor how the allocation remained unpredictable.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Judgement comment: the authors did not describe whether the participants were blinded; they only stated that the intervention occurred in a separate room, away from the control group.
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Quote: "All outcome measures were assessed prior to the start of the intervention and then again after 6 weeks. The outcome measures included trunk control ability, and dynamic balance ability in the sitting position. All tests were performed by a skilled physical therapist who did not participate in the training program." Judgement comment: the authors did not state that the assessor was blind for group allocation.
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "Two subjects dropped out of the study due to discharge." Judgement comment: the reasons were given in this study and one dropout occurred in each group.
Selective reporting (reporting bias)	Unclear risk	Judgement comment: all reported outcomes were significant in favour of the experimental group. No study registration was available.
Other bias	Low risk	No other potential sources of bias found

Lee 2014a

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to investigate the effectiveness of sling exercise therapy on activating trunk muscles and improving balance ability in stroke patients based on the concept of closed kinetic chain exercises
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 63.40 ± 4.94 • Number of participants: 10 • Sex (women/men): not reported • Type of stroke event (I/H): not reported • Location of stroke event (L/R): not reported • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: more than 24 months since diagnosis of stroke with chronic hemiplegia Control group (same amount of additional therapy) • Mean age and SD: 62.50 ± 8.48 • Number of participants: 10 • Sex (women/men): not reported • Type of stroke event (I/H): not reported • Location of stroke event (L/R): not reported • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: more than 24 months since diagnosis of stroke with chronic hemiplegia **Inclusion criteria:** study participants were selected if they met the following criteria: more than 24 months since diagnosis of stroke with chronic hemiplegia, MMSE-K score higher than 21, independent walking, ability to communicate, and no neurologic disease besides stroke **Exclusion criteria:** not reported **Pretreatment:** no significant difference was observed in trunk muscle activity, BBS, FICSIT-4, TUG test, or BioRescue before intervention between the 2 groups. **Sample size calculation:** not calculated
Interventions	**Intervention characteristics** Experimental training • Type of intervention: sling exercise therapy for strengthening trunk muscles comprised 3 types of exercises: bridge exercises in the supine, prone, and lateral decubitus positions. In each exercise, the position was maintained for 7 s followed by 10 s of relaxation; each set was repeated 10 times, and a total of 3 sets were performed. The rest interval between sets was 60 s.

Lee 2014a *(Continued)*

- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 3 sessions/week/4 week, 30 minutes each session
- Total minutes of intervention: 360
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: not specified
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): at the beginning of the intervention, an auxiliary elastic rope was used.
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not specified
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: auxiliary elastic rope
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: the regular exercise included 3 types of exercises — bridge exercises in the supine, prone, and lateral decubitus positions — performed with the help of an auxiliary table. The duration of maintaining the position and breaks were also the same as those in for the sling exercise therapy (SET) group
- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 3 sessions/week/4 week, 30 minutes each session
- Total minutes of intervention: 360
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: not specified
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): no
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not specified
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: wedge and roll
- Reporting of death and serious adverse events, including falls: not reported

Outcomes	Walking ability • Outcome type: continuous outcome • Scale: TUG (s) • Direction: lower is better • Data value: change from baseline Standing balance • Outcome type: continuous outcome • Scale: Berg Balance Scale • Range: 0-56 • Direction: higher is better • Data value: change from baseline

Lee 2014a *(Continued)*

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "After the 20 participants passed the pretest, they were randomly allocated to either the SET group or the regular exercise (i.e. control) group (Table 1)." Judgement comment: no detailed description was available.
Allocation concealment (selection bias)	Unclear risk	Judgement comment: they were randomly allocated to the groups. No detailed description was available to prevent forseeing the allocation.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Judgement comment: not described in this study
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Judgement comment: not described in this study
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No details available in this study
Selective reporting (reporting bias)	High risk	No study registration was available and all outcomes were reported as significant difference in favour of the experimental group.
Other bias	Unclear risk	Not clear if any other forms of biases were reduced to permit 'low risk' or 'high risk'

Lee 2014b

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to investigate the effect of AR-based postural control training on dynamic balance, spatio-temporal variables of gait, and functional gait ability of stroke patients
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 47.9 ± 12.0 • Number of participants: 10 • Sex (women/men): 2/8 • Type of stroke event (I/H): not reported • Location of stroke event (L/R): not reported • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported

Lee 2014b *(Continued)*

- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 11.7 ± 4.5

Control group (no additional therapy)

- Mean age and SD: 54.0 ± 11.9
- Number of participants: 11
- Sex (women/men): 5/6
- Type of stroke event (I/H): not reported
- Location of stroke event (L/R): not reported
- stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 11.0 ± 4.7

Inclusion criteria: a diagnosis of stroke for at least 6 months (chronic stroke), not taking medication that can affect balance, MMSE score < 24, no pain or disability associated with acute musculoskeletal conditions, sitting to side lying with moderate assistance, sitting for longer than 10 seconds without support, and standing without support for 1 minute

Exclusion criteria: Pusher syndrome. All participants provided written informed consent prior to enrolment in the study.

Pretreatment: no significant differences between groups at baseline

Sample size calculation: according to a pilot study, the effect size for TUG, Berg Balance Scale, gait velocity, cadence, step length, and stride length was 0.69, 0.58, 0.52, 0.60, 0.57, and 0.53, respectively. This study would thus require 10 patients in each group in order to have 80% power at an alpha of 0.05.

Interventions	**Intervention characteristics** Experimental training • Type of intervention: AR-based postural control training consisted of three stages and 16 subordinate scopes. The first stage includes six subordinated exercise programmes that were conducted without the use of any tool in a lying position. The second stage involved four subordinated exercise programmes performed while sitting. The third stage consisted of six subordinated exercise programmes in the standing position performed using a therapeutic ball or a foothold. The modelled movement was shown on the individual's side and the actual movement was shown on the other side. The patient could watch the modelled movement and listen to a recorded sound, in order to compare the normal movement with his/her own movement. • Length of intervention in minutes, days, or weeks: 4 weeks • Total number of repetitions: 3 sessions/week, 4 weeks, 30 minutes each session • Total minutes of intervention: 360 • Total minutes of conventional therapy: 600 • Content of standard care: general physical therapy programme • Who provided study therapy: not mentioned • How provided (face-to-face, internet, telephone, individual, in group): face-to-face • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): the AR training was designed to be adjustable, in order to match the patient's ability to minimise substitution movements and to ensure safety. • Modification (intervention was modified during the course of the study?): no • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 0 dropouts • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not evaluated

Lee 2014b *(Continued)*

- Material used: ball or a foothold, the augmented reality environment was implemented using a server computer mounted with a camera and an Super VideoGraphics Array (SVGA) head-mounted display (HMD; i-visor, fx601; Dae-Yang E&C Co, Gongju, Korea, 2008) consisting of an 800 600 resolution display connected to an ultra mobile personal computer (NT-Q1U; Samsung, Suzhou, China, 2007) for the patients. The two computers were installed for wireless exchange of signals.
- Reporting of death and serious adverse events, including falls: not reported

Control group (no additional therapy)

- Type of intervention: only standard care.
- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: not reported
- Total minutes of intervention: not reported
- Total minutes of conventional therapy: 600
- Content of standard care: general physical therapy programme
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 1 dropout
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes

Walking speed (cm/s)

- Outcome type: continuous outcome
- Direction: higher is better
- Data value: change from baseline

Walking ability

- Outcome type: continuous outcome
- Scale: TUG (s)
- Direction: lower is better
- Data value: change from baseline

Standing balance

- Outcome type: continuous outcome
- Scale: Berg Balance Scale
- Range: 0-56
- Direction: higher is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Judgement comment: each participant chose a piece of paper with number 1 or 2 written on it from a box containing 22 pieces of paper; there were 11

Lee 2014b *(Continued)*

		pieces of paper for each number. Papers with a number 1 indicated the experimental group and those with a number 2 indicated the control group.
Allocation concealment (selection bias)	High risk	Judgement comment: each participant chose a piece of paper with number 1 or 2 written on it from a box containing 22 pieces of paper; there were 11 pieces of paper for each number. Papers with a number 1 indicated the experimental group and those with a number 2 indicated the control group.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not described if participants or personnel were blinded
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not described if assessor was blinded
Incomplete outcome data (attrition bias) All outcomes	Low risk	Judgement comment: 1 dropout in the control group
Selective reporting (reporting bias)	Low risk	Judgement comment: no study registration available; results contained significant and non significant results.
Other bias	Low risk	No other potential sources of bias found

Lee 2016a

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to investigate the effects of a canoe game-based VR training programme for trunk postural control, balance, and upper limb motor function after stroke. Its secondary aim was to evaluate the usability of the approach.
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 65.2 ± 5.0 • Number of participants: 5 • Sex (women/men): 2/3 • Type of stroke event (I/H): 4/1 • Location of stroke event (L/R): 1/4 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 3.1 ± 1.6 Control group (no additional therapy) • Mean age and SD: 66.2 ± 3.4 • Number of participants: 5 • Sex (women/men): 3/2

Lee 2016a *(Continued)*

- Type of stroke event (I/H): 4/1
- Location of stroke event (L/R): 2/3
- stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 3.3 ± 1.1

Inclusion criteria: (1) non-cerebellar stroke within the previous 6 months; (2) ability to understand and follow simple verbal instructions; (3) MMSE score of ≥ 21-22); (4) minimum Berg Balance Scale score of 15 (the minimum level deemed safe for balance intervention participation); and (5) ability to walk 10 m independently, with or without an assistance device

Exclusion criteria: (1) psychiatric disorder or dementia, (2) apraxia or hemi-neglect, (3) epilepsy or pacemaker use (as per NintendoWii safety guidelines), (4) severe pain in the hemiplegic shoulder, and (5) a participation rate of < 80%

Pretreatment: no significant differences in general characteristics and dependent variables were observed between the experimental and control groups.

Sample size calculation: not calculated

Interventions

Intervention characteristics

Experimental training

- Type of intervention: the canoeing game in the Nintendo WiiSports Resort package was used as a VR training programme. To create realistic effects (e.g. swaying from side to side), a canoe was made by attaching a chair to a springboard (width, 45 cm; diameter, 150 cm; height, 20 cm). The participants paddled by grasping the motion controller, which was inserted in a canoe paddle accessory, alternating between hands while sitting on the springboard. The grip gloves were provided to the participants who had difficulty grasping the motion controller. The participants controlled the paddling according to the direction of the movement of the virtual character that was shown on the LCD screen. They also adjusted their trunk to maintain balance on the springboard during paddling. For safety, the programme was conducted with the participants wearing a belt around the waist. The first session, conducted for 5 minutes, was a free-practice mode for familiarisation and warm-up. The second session, conducted for 10 minutes, was a timed-run mode, designed to achieve a personal record of the distance travelled in a limited time period. The third session, conducted for 15 minutes, was a competition mode designed to improve motivation through competition with the caregiver or therapist.
- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 3 sessions/week, 4 weeks, 30 minutes per session
- Total minutes of intervention: 360
- Total minutes of conventional therapy: 1200 physical therapy + 1200 occupational therapy + 300 functional electrical stimulation
- Content of standard care: conventional rehabilitation programme that consisted of physical therapy, occupational therapy, and functional electrical stimulation (FES). Physical therapy was conducted for gait training and lower limb strengthening, based on the neurodevelopmental treatment (NDT) concept, for 30 minutes twice a day, 5 days a week, for 4 weeks. Occupational therapy was also administered for 30 minutes twice a day, 5 days a week, for 4 weeks, to improve performance in activities of daily living. Functional electrical stimulation was applied simultaneously to both the upper and lower limbs for 15 minutes a day, 5 days a week, for 4 weeks.
- Who provided study therapy: caregiver or therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): no
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 2 dropouts, 1 due to early discharge, 1 because of low participation rate

Lee 2016a *(Continued)*

- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): 1 participant had a participation rate < 80%.
- Material used: Nintendo WiiSports Resort package and attaching a chair to a springboard (width, 45 cm; diameter, 150 cm; height, 20 cm)
- Reporting of death and serious adverse events, including falls: safety-related incidents such as falls, dizziness, and epilepsy did not occur during the intervention.

Control group (no additional therapy)

- Type of intervention: only standard care
- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: not reported
- Total minutes of intervention: not reported
- Total minutes of conventional therapy: 1200 physical therapy + 1200 occupational therapy + 300 functional electrical stimulation
- Content of standard care: conventional rehabilitation programme that consisted of physical therapy, occupational therapy, and functional electrical stimulation (FES). Physical therapy was conducted for gait training and lower limb strengthening, based on the neurodevelopmental treatment (NDT) concept, for 30 min twice a day, 5 days a week, for 4 weeks. Occupational therapy was also administered for 30 min twice a day, 5 days a week, for 4 weeks, to improve performance in activities of daily living. Functional electrical stimulation was applied simultaneously to both the upper and lower limbs for 15 min a day, 5 days a week, for 4 weeks
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 2 dropouts, due to early discharge
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes	Trunk function • Outcome type: continuous outcome • Scale: TIS 1.0 • Range: 0-23 • Direction: higher is better • Data value: change from baseline Standing balance • Outcome type: continuous outcome • Scale: Berg Balance Scale • Range: 0-56 • Direction: higher is better • Data value: change from baseline Walking ability • Outcome type: continuous outcome • Scale: TUG (s) • Unit of measure: s • Direction: lower is better • Data value: change from baseline

Lee 2016a *(Continued)*

	Arm-hand function • Outcome type: continuous outcome • Scale: Fugl-Meyer Assessment-upper extremity • Direction: higher is better • Data value: change from baseline
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "After the pretest, the participants were randomly allocated to the experimental group (EG, n = 7) or control group (CG, n = 7). The randomization process was performed by using computer-generated numbers produced by a basic random number generator."
Allocation concealment (selection bias)	Unclear risk	No details were described.
Blinding of participants and personnel (performance bias) All outcomes	High risk	No double blinding
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not described if assessor was blinded during the study
Incomplete outcome data (attrition bias) All outcomes	High risk	Quote: ". Two participants in the EG and two in the CG dropped out because of early discharge and a participation rate of < 80%. Thus, 5 participants in the experimental and control groups, respectively, completed the study." Judgement comment: the study contained a small sample size (14), of which there were 4 dropouts (a high percentage: 28.5%). The reasons for dropouts were described in this study.
Selective reporting (reporting bias)	High risk	Judgement comment: P value was not provided.
Other bias	Low risk	No other potential sources of bias found

Lee 2017a

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to evaluate the effect of whole-body vibration therapy on subacute stroke patients who could not gain sitting balance
Participants	**Baseline Characteristics** Experimental training • Mean age and SD: 59.1 ± 16.9

Lee 2017a *(Continued)*

- Number of participants: 15
- Sex (women/men): 7/8
- Type of stroke event (I/H): 8/7
- Location of stroke event (L/R): 10/5
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline, neglect: 9
- Mean time and SD after stroke in days: 18.4 ± 6.9
- Comorbidity at baseline, Pusher: 9

Control group (same amount of additional therapy)

- Mean age and SD: 64.4 ± 14.8
- Number of participants: 15
- Sex (women/men): 8/7
- Type of stroke event (I/H): 9/6
- Location of stroke event (L/R): 9/6
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline, neglect: 7
- Mean time and SD after stroke in days: 25.3 ± 12.2
- Comorbidity at baseline, Pusher: 6

Inclusion criteria: medically stable subacute stroke patients within two months of the onset of their stroke who could not maintain their sitting balance independently for 30 s, and who had a static TIS score less than two points

Exclusion criteria: patients who had a history of a past cerebrovascular accident, had non-stroke related sensory or motor impairments, used medication that could interfere with postural controls, or who had contraindications for WBV, such as pregnancy, recent fractures, gallbladder or kidney stones, malignancies, or a cardiac pacemaker, were excluded from the study.

Pretreatment: there were no significant differences between the age, gender, type of stroke, affected side, number of days from stroke onset, neglect, incidence of Pusher syndrome, MMSE-K scores, K-MBI scores, FAC scores, BBS scores, and TIS scores of the two groups at the baseline.

Sample size calculation: to calculate a sample size, a statistical program (G-power 3.1) was used. Based on a power of 80% and a 2-tailed level of 0.05, we calculated that the sample size required per group was 13. Assuming a 10% loss to follow-up, we estimated that the final sample size required was 15 per group, for a total of 30 patients for the study.

Interventions	**Intervention characteristics** Experimental training • Type of intervention: whole-body vibration group. Patients in the VG were seated on the vibration platform and received vibration therapy for 30 min. The frequency of the vibrator was 40 Hz and the intensity was 30. Patients tried to sit and lean on the column connected to the balance platform independently. • Length of intervention in minutes, days, or weeks: 2 weeks • Total number of repetitions: 1 session/day, 5 days/week, 2 weeks, 30 minutes each session • Total minutes of intervention: 300 • Total minutes of conventional therapy: 300 • Content of standard care: Conventional physical therapy including sitting balance training: (1) adjusting and maintaining the body alignment by using the arms while sitting on the mat, (2) adjusting and maintaining the body alignment without using the arms while sitting on the mat, (3) sitting on the

Lee 2017a *(Continued)*

mat and turning the body to touch the opposite side of the mat using unaffected upper extremity, (4) sitting on the mat and turning the body to touch the opposite side of the mat using affected upper extremity

- Who provided study therapy: physical therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): no
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not evaluated
- Material used: Sonix® (Sonic World, Wonju, Korea)
- Reporting of death and serious adverse events, including falls: no other complications, such as dizziness, lower limb soreness and fatigue, or itching sensation occurred.

Control group (same amount of additional therapy)

- Type of intervention: the CG received conventional physical therapy, including sitting balance training. (1) adjusting and maintaining the body alignment by using the arms while sitting on the mat, (2) adjusting and maintaining the body alignment without using the arms while sitting on the mat, (3) sitting on the mat and turning the body to touch the opposite side of the mat using unaffected upper extremity, (4) sitting on the mat and turning the body to touch the opposite side of the mat using affected upper extremity
- Length of intervention in minutes, days, or weeks: 2 weeks
- Total number of repetitions: 1 session/day, 5 days/week, 2 weeks, 30 minutes each session
- Total minutes of intervention: 300
- Total minutes of conventional therapy: 300
- Content of standard care: conventional physical therapy including sitting balance training: (1) adjusting and maintaining the body alignment by using the arms while sitting on the mat, (2) adjusting and maintaining the body alignment without using the arms while sitting on the mat, (3) sitting on the mat and turning the body to touch the opposite side of the mat using unaffected upper extremity, (4) sitting on the mat and turning the body to touch the opposite side of the mat using affected upper extremity
- Who provided study therapy: physical therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): no
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not evaluated
- Material used: mat
- Reporting of death and serious adverse events, including falls: none reported

Outcomes	Activities of daily living • Outcome type: continuous outcome • Scale: Barthel Index • Range: 0-100 • Direction: higher is better • Data value: change from baseline Walking ability • Outcome type: continuous outcome

Lee 2017a *(Continued)*

- Scale: FAC
- Range: 0-5
- Direction: higher is better
- Data value: change from baseline

Standing balance

- Outcome type: continuous outcome
- Scale: Berg Balance Scale
- Range: 0-56
- Direction: higher is better
- Data value: change from baseline

Trunk function

- Outcome type: continuous outcome
- Scale: TIS 1.0
- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "The randomization was achieved through consultation with statistical experts so such that the relationship of the control group was assigned randomly via a simple randomization. The randomization sequence was computer generated by an investigator not involved in recruitment or treatment allocation."
Allocation concealment (selection bias)	Low risk	Quote: "Allocation was concealed in sequentially numbered, sealed, opaque envelopes and then the participants were randomly assigned to the VG (n = 15) or the CG (n = 15)."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Judgement comment: not described in this study
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Quote: "These evaluations were conducted at baseline and immediately after two weeks of therapy. In order to avoid bias in the results, another therapist who did not participate in the therapy and who had no relation to the present study assessed all the results."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Judgement comment: no dropouts
Selective reporting (reporting bias)	Low risk	Judgement comment: significant and not significant results were presented.
Other bias	Unclear risk	Not sure if there were any other types of biases

Lee 2017b

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to examine the effects of upper extremity task training with the bracing method applied on trunk adjustment ability and balance in stroke patients
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 60.4 ± 10.5 • Number of participants: 23 • Sex (women/men): 10/13 • Type of stroke event (I/H): not reported • Location of stroke event (L/R): 16/7 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 17.7 ± 10.4 Control group (same amount of additional therapy) • Mean age and SD: 58.1 ± 10.7 • Number of participants: 23 • Sex (women/men): 9/14 • Type of stroke event (I/H): not reported • Location of stroke event (L/R): 13/10 • stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 16.5 ± 11.2 **Inclusion criteria:** non-traumatic hemiplegic stroke patient, onset of stroke had occurred at least six months earlier, all scored at least 24 on the MMSE-K. They were able to sit unassisted for five minutes or longer without special equipment. The patients were able to understand and follow the therapist's directions and had no other neurological problems (vision, hearing, other senses) or orthopaedic damage. **Exclusion criteria:** not reported **Pretreatment:** baseline characteristics were given; no between-groups statistical test was performed. **Sample size calculation:** not calculated
Interventions	**Intervention characteristics** Experimental training • Type of intervention: the participants of the experimental group (upper extremity task-training group with symmetric abdominal muscle contraction) received upper extremity task training while maintaining symmetric abdominal muscle contraction (referred to here as "bracing"). They made brief "ch" sounds while they concurrently contracted left and right and forward and backward trunk muscles isometrically for five seconds as if force was given to the abdomen reflexively, and while maintaining shallow respiration. The participants also engaged in upper extremity task training. During the training, each participant sat on a chair with a back. They flexed the hip, knee, and ankle joints of both

Lee 2017b *(Continued)*

lower extremities by 90 degrees and placed both feet on the floor. They were instructed to utilise only the paretic upper extremity and were assisted in the movement so that they did not exert compensatory strategies.

- Length of intervention in minutes, days, or weeks: not specified
- Total number of repetitions: 6 x 5 minutes
- Total minutes of intervention: 30 minutes
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: not specified
- How provided (face-to-face, internet, telephone, individual, in group): not specified
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): the order and duration of the tasks were adjusted according to the participants's function. For example, participants who showed good function in one task were asked to stop and move on to the next task. If they were not able to perform the next task due to poor function, they performed the previous task for an extended amount of time
- Modification (intervention was modified during the course of the study?): not specified
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not specified
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not specified
- Material used: not specified
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: the control group (general upper extremity task-training group) received upper extremity task training. During the training, each participant sat on a chair with a back. They flexed the hip, knee, and ankle joints of both lower extremities by 90 degrees and placed both feet on the floor. They were instructed to utilise only the paretic upper extremity and were assisted in the movements so that they didn't exert compensatory strategies. Six numbered tasks were performed in sequence for five to six minutes. The order and duration of the tasks were adjusted according to the participant's function. For example, participants who showed good function in one task were asked to stop and move on to the next task. If they were not able to perform the next task due to poor function, they performed the previous task for an extended amount of time.
- Length of intervention in minutes, days, or weeks: not specified
- Total number of repetitions: 6 x 5 minutes
- Total minutes of intervention: 30 minutes
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: not specified
- How provided (face-to-face, internet, telephone, individual, in group): not specified
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not specified
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not specified
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not specified
- Material used: not specified
- Reporting of death and serious adverse events, including falls: not reported

Outcomes	Trunk function • Outcome type: continuous outcome • Scale: TIS 1.0 • Range: 0-23

Lee 2017b *(Continued)*

- Direction: higher is better
- Data value: change from baseline

Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not described
Allocation concealment (selection bias)	Unclear risk	Not described
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not described
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not described
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not described
Selective reporting (reporting bias)	Unclear risk	Judgement comment: non-significant results were reported. However, the exact P value was not reported in the trial.
Other bias	Unclear risk	Other types of biases were not described for ruling out.

Lee 2020a

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to examine the effects of trunk exercises on unstable surfaces on different domains of balance ability for persons in the subacute stage of stroke. It was hypothesised that trunk exercise training on unstable surfaces would significantly improve trunk control and balance.
Participants	**Baseline characteristics** Experimental training (unstable-surface training) • Mean age and SD: 60.2 ± 11.7 • Number of participants: 18 • Sex (women/men): 8/10 • Type of stroke event (I/H): 6/12 • Location of stroke event (L/R): 12/6 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported

Lee 2020a *(Continued)*

- Comorbidity at baseline: not reported
- Mean time and SD after stroke in weeks: 7.0 ± 2.7

Control group

- Mean age and SD: 62.4 ± 13.3
- Number of participants: 17
- Sex (women/men): 8/9
- Type of stroke event (I/H): 6/11
- Location of stroke event (L/R): 10/7
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in weeks: 6.9 ± 2.2

Inclusion criteria: patients with first-time stroke with onset from one to six months, who were able to sit without support for at least 30 s and follow experimental instructions

Exclusion criteria: age over 80 or having musculoskeletal or other neuromuscular conditions that could affect balance. To minimise measurement ceiling effects, those who obtained the maximum score in the TIS (maximal score = 23) were excluded.

Pretreatment: between-group differences were non-significant.

Sample size calculation: not calculated

Interventions	**Intervention characteristics** Experimental training (unstable-surface training) • Type of intervention: the experimental group received trunk exercises training in hook-lying and sitting. There were four exercises in the hook-lying position: (1) abdominal draw-in manoeuvre with a balance pad (AIREXÆ, 48406 cm, Sins, Switzerland) under the buttocks, (2) abdominal muscles isometric contraction, (3) lower trunk rotation, and (4) bridging combining with abdominal draw-in manoeuvre. For exercises 2~4, the level of support surface instability would be increased gradually by first placing the balance pad under the feet, then placing a BOSU ball (26 cm in diameter, 21.6–22.9 cm in height when inflated; BOSUÆ, Ashland, OH, USA) under the feet, and then finally placing the balance pad under the buttocks. There were two levels of sitting exercises. For the first level, the participant sat without back or foot support first on the balance pad, then progressed to sitting on the BOSU ball. There were five exercises in this level: (1) pelvic anterior and posterior tilt, (2) pelvic lateral tilt, (3) trunk flexion, extension and rotation, (4) affected arm lateral reach with a Swiss ball (55 cm, TheragearÆInc, Mission, BC, Canada) under the arm for support and guidance, and (5) pelvic rotation. For the second level, the participant sat on a Swiss ball (65 cm) with their feet flat on the ground. There were five exercises in this level: (1) maintaining quiet sitting with chest expansion exercises, (2) pelvic anterior and posterior tilt, (3) pelvic lateral tilt, (4) stepping, and (5) stepping with arm swing. • Length of intervention in minutes, days, or weeks: 6 weeks • Total number of repetitions: 2 sessions/week, 6 weeks, 30 minutes per session • Total minutes of intervention: 360 • Total minutes of conventional therapy: not reported • Content of standard care: daily physical therapy for stroke, including mobility training and muscle strengthening • Who provided study therapy: trained physical therapist • How provided (face-to-face, internet, telephone, individual, in group): face-to-face • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported • Modification (intervention was modified during the course of the study?): not reported • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported

Lee 2020a *(Continued)*

- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: balance pad (AIREXÆ, 48406 cm, Sins, Switzerland) and BOSU ball (26 cm in diameter, 21.6–22.9 cm in height when inflated; BOSUÆ, Ashland, OH, USA)
- Reporting of death and serious adverse events, including falls: not reported

Control group

- Type of intervention: the control group received upper limb range of motion exercises at comfortable speeds in a well-supported sitting position.
- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 2 sessions/week, 6 weeks, 30 minutes per session
- Total minutes of intervention: 360
- Total minutes of conventional therapy: not reported
- Content of standard care: daily physical therapy for stroke, including mobility training and muscle strengthening
- Who provided study therapy: trained physical therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes

Leg function

- Outcome type: continuous outcome
- Scale: Fugl-Meyer Assessment-Lower Extremity
- Range: 0-34
- Direction: higher is better
- Data value: change from baseline

Trunk function

- Outcome type: continuous outcome
- Scale: TIS 1.0
- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Walking ability

- Outcome type: continuous outcome
- Scale: 6 m walk test (m)
- Direction: lower is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement

Lee 2020a *(Continued)*

Random sequence generation (selection bias)	Low risk	Quote: "Randomization was conducted by using a computer randomization program."
Allocation concealment (selection bias)	Unclear risk	Judgement comment: no details were described.
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: participants and personnel were not blinded.
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "This study was an assessor-blinded randomized controlled trial designed to examine the effect of trunk exercises on unstable surfaces on balance ability in persons with subacute stroke."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Judgement comment: one dropout in the experimental group, two in the control group. Reasons were provided.
Selective reporting (reporting bias)	Low risk	Judgement comment: registration was available and there was no selective reporting.
Other bias	Low risk	No other potential sources of bias found

Lee 2020b

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to verify the effects of trunk stability exercise using additional maneuvers on measures of muscle thickness, functional mobility and balance in subjects with stroke
Participants	**Baseline characteristics** Experimental training (abdominal bracing manoeuvre trunk training) • Mean age and SD: 69.57 ± 11.75 • Number of participants: 10 • Sex (women/men): 7/3 • Type of stroke event (I/H): 5/5 • Location of stroke event (L/R): not reported • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in weeks: chronic Experimental training (abdominal hollowing trunk training) • Mean age and SD: 66.89 ± 10.00 • Number of participants: 10 • Sex (women/men): 4/6 • Type of stroke event (I/H): 6/4 • Location of stroke event (L/R): not reported

Lee 2020b *(Continued)*

- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in weeks: chronic

Control group

- Mean age and SD: 68.57 ± 9.54
- Number of participants: 10
- Sex (women/men): 4/6
- Type of stroke event (I/H): 4/6
- Location of stroke event (L/R): not reported
- stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in weeks: chronic

Inclusion criteria: history of first stroke, being able to walk with or without a walking aid independently or under supervision

Exclusion criteria: other neurological disorders, severe arthritis, joint replacement surgery and blindness, or lack of provision of consent to participate

Pretreatment: there were no significant differences in the baseline values among groups.

Sample size calculation: not calculated

Interventions

Intervention characteristics

Experimental training (abdominal bracing manoeuvre trunk training, additional therapy)

- Type of intervention: the experimental group using bracing manoeuvre performed trunk stability exercises with bracing manoeuvre, contracting all the muscles of the abdominal and back as producing inter-abdominal pressure to compress the pelvic floor muscles
- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 3 sessions/week, 6 weeks, 20 minutes/session
- Total minutes of intervention: 360
- Total minutes of conventional therapy: not reported
- Content of standard care: physical therapy occupational therapy, and nursing care. The physical therapy programme takes a comprehensive approach, such as improvement of functions and disabilities, including trunk movement, basic activity, task-oriented training, and a compensatory approach using supplementary devices.
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: no fall or other adverse events associated with either intervention occurred during the periods.

Experimental training (abdominal hollowing trunk training, additional therapy)

Lee 2020b *(Continued)*

- Type of intervention: the abdominal hollowing experimental group conducted trunk stability exercises with abdominal hollowing, drawing-in the lower part of the abdomen up and in toward the spine, without movement of the trunk or pelvis while continuing to breathe normally as a selective contraction of TrA.
- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 3 sessions/week, 6 weeks, 20 minutes/session
- Total minutes of intervention: 360
- Total minutes of conventional therapy: not reported
- Content of standard care: physical therapy occupational therapy, and nursing care. The physical therapy programme takes a comprehensive approach, such as improvement of functions and disabilities, including trunk movement, basic activity, task-oriented training, and a compensatory approach using supplementary devices.
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: no fall or other adverse events associated with either intervention occurred during the periods.

Control group

- Type of intervention: not reported
- Length of intervention in minutes, days, or weeks: not reported
- Total number of repetitions: not reported
- Total minutes of intervention: not reported
- Total minutes of conventional therapy: not reported
- Content of standard care: physical therapy occupational therapy, and nursing care. The physical therapy programme takes a comprehensive approach, such as improvement of functions and disabilities, including trunk movement, basic activity, task-oriented training, and a compensatory approach using supplementary devices.
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): Not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes	Walking ability • Outcome type: continuous outcome • Scale: TUG • Direction: higher is better • Data value: pre- and post-data Walking ability

Lee 2020b *(Continued)*

- Outcome type: continuous outcome
- Scale: Ten-Meter Walk Test
- Direction: lower is better
- Data value: pre- and post-data

Standing Balance

- Outcome type: continuous outcome
- Scale: Berg Balance Scale
- Range: 0-56
- Direction: higher is better
- Data value: pre- and post-data

Notes		
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Quote: "They were divided randomly into three groups: the experimental group using abdominal hollowing manoeuvre (AH), the experimental group using bracing manoeuvre (AB), and the control group." Judgement comments: no details were provided about how the randomisation had been sequenced.
Allocation concealment (selection bias)	Unclear risk	Judgement comment: no details of concealment were described in the manuscript.
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "Clinical evaluations were performed by a independent assessor who was blinded to group assignment and not involved in treatment." Judgement comments: only the assessor was blinded, not the participants or study personnel.
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Clinical evaluations were performed by an independent assessor who was blinded to group assignment and not involved in treatment." Judgement comments: stated that the assessor was blinded
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "Thirty stroke patients successfully completed the training sessions."
Selective reporting (reporting bias)	Low risk	Judgement comment: no registration available. However, both significant and non-significant results were provided.
Other bias	Low risk	—

Lee MM 2018

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group

Lee MM 2018 *(Continued)*

Aim: to investigate the effects of game-based VR canoe paddling training, when combined with conventional physical rehabilitation programmes, on postural balance and upper extremity function in 30 patients with subacute stroke

Participants	**Baseline characteristics** Experimental training • Mean age and SD: 61.80 ± 6.80 • Number of participants: 15 • Sex (women/men): 6/9 • Type of stroke event (I/H): 9/6 • Location of stroke event (L/R): 6/9 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 3.43 ± 1.34 Control group (no additional therapy) • Mean age and SD: 61.33 ± 8.44 • Number of participants: 15 • Sex (women/men): 6/9 • Type of stroke event (I/H): 10/5 • Location of stroke event (L/R): 5/10 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 3.13 ± 1.54 **Inclusion criteria:** participants were selected if they met the following criteria: subacute stroke within the prior six months; an MMSE score 21; moderate (7–11) to good (12–16) scores on the TIS; and the ability to stand independently for at least 3 minutes without an assistive device. **Exclusion criteria:** a history of a psychiatric disorder, dementia, apraxia or hemi-neglect, epilepsy, the presence of a pacemaker, severe pain in the hemiplegic shoulder, ataxia, or any other cerebellar symptoms. Individuals who began the study, but participated in less than 80% of the intervention activities, were also excluded from the study. **Pretreatment:** there were no significant differences in the general characteristics between the two groups, or dependent variables between the two groups. **Sample size calculation:** to determine the sample size, the G*Power 3.19 statistical power analysis software program was used. The alpha level and the power were set as 0.05 and 0.8, respectively. According to a prior pilot test, the effective size was set at 0.94, and at least 15 participants were required in each group.
Interventions	**Intervention characteristics** Experimental training • Type of intervention: the canoe paddling game used for the VR training programme in this study was the Nintendo Wii Sports Resort game (Nintendo®, Kyoto, Japan). To simulate the swaying from side to side that occurs in an actual canoe; the canoe-like apparatus was created by fixing a chair to a springboard (W: 45 cm × D: 150 cm × H: 20 cm) (Pedalo® Springboard, Germany). While seated on the springboard, the study participants performed a paddling movement with both hands grasping the motion controller that was inserted in a separate canoe paddle accessory (Nintendo®, Kyoto, Japan).

Lee MM 2018 *(Continued)*

Grip-assist gloves were provided for patients who found it difficult to grasp the motion controller. The study participants operated the paddle in the direction of the virtual character displayed on an LED TV 42LN549C screen (LG Electronics, Korea) during the intervention sessions. Also, study participants were instructed to focus on trunk control to maintain their balance on top of the springboard, while canoe paddling. For safety reasons, the patients wore a safety belt on their waist during the training. The intervention consisted of three sessions. The first session was carried out in a 'free practice' mode for 5 minutes to allow patients to warm up and familiarise themselves with the programme. The second session was performed in a 'timed run' mode in which each patient established a personal record of paddling distance during 15 minutes. The third session was performed in a 'competition mode.' during which the patient was motivated to improve their performance by competing with a caregiver or therapist for 10 minutes. Improvements in the personal records for paddling distance during the timed run mode were used as indicators of achievement by comparison with previous results.

- Length of intervention in minutes, days, or weeks: 5 weeks
- Total number of repetitions: 3 sessions/week, 5 weeks, 30 minutes/session
- Total minutes of intervention: 450
- Total minutes of conventional therapy: 1500
- Content of standard care: consisting of physical therapy and occupational therapy. Physical therapy aimed at improving balance and lower limb strength to facilitate walking; occupational therapy was used to improve the performance of ADL.
- Who provided study therapy: caregiver or therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not mentioned
- Modification (intervention was modified during the course of the study?): not mentioned
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): participation rate was evaluated
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): one participant had a participation rate < 80%.
- Material used: Nintendo Wii Sports Resort game (Nintendo®,Kyoto, Japan). To simulate the swaying from side to side that occurs in an actual canoe; the canoe-like apparatus was created by fixing a chair to a springboard (W: 45 cm × D: 150cm × H: 20 cm) (Pedalo® Springboard, Germany)
- Reporting of death and serious adverse events, including falls: during the intervention process, there were some complaints from the study participants regarding shoulder pain due to increase in the use of the upper extremity, since the use of hemiparetic side was difficult.

Control group (no additional therapy)

- Type of intervention: not reported
- Length of intervention in minutes, days, or weeks: not reported
- Total number of repetitions: not reported
- Total minutes of intervention: not reported
- Total minutes of conventional therapy: 1500
- Content of standard care: consisting of physical therapy and occupational therapy. Physical therapy aimed at improving balance and lower limb strength to facilitate walking; occupational therapy was used to improve the performance of ADL.
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Lee MM 2018 *(Continued)*

Outcomes	Manual function test-hand • Outcome type: continuous outcome • Direction: higher is better • Data value: change from baseline Arm-hand function • Outcome type: continuous outcome • Scale: Manual Function Test-upper limb • Direction: higher is better • Data value: change from baseline Trunk function • Outcome type: continuous outcome • Scale: Modified Functional Reach Test-anterior reach (cm) • Unit of measure: cm • Direction: higher is better • Data value: change from baseline
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "The randomization process was performed using Random Allocation software for parallel group randomized studies".
Allocation concealment (selection bias)	Unclear risk	Not clear if concealment was allocated
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Quote: "All the participants in this study signed informed consents after receiving a detailed explanation of the study objectives and requirements."
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "assessor-blinded"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "One of the 16 study participants in the experimental group was excluded from the analysis because of a participation rate less than 80%."
Selective reporting (reporting bias)	Low risk	Judgement comment: no study registration available; P values, significant and non-significant results were reported.
Other bias	Low risk	No other potential sources of bias found

Liu 2020

Study characteristics

Methods	**Study design:** RCT

Liu 2020 *(Continued)*

Study grouping: parallel group
Aim: to investigate the effectiveness of four-week sling exercise therapy on balance, the ability to perform activities of daily living, mobility, quality of life and shoulder pain after stroke

Participants	**Baseline characteristics** Experimental training • Mean age and SD: 56.52 ± 9.22 • Number of participants: 25 • Sex (women/men): 7/18 • Type of stroke event (I/H): 7/18 • Location of stroke event (L/R): 15/10 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 2.26 ± 1.73 Control group (same amount of additional therapy) • Mean age and SD: 56.6 ± 9.12 • Number of participants: 25 • Sex (women/men): 8/17 • Type of stroke event (I/H): 10/15 • Location of stroke event (L/R): 13/12 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 1.96 ± 1.09 **Inclusion criteria:** 1) diagnosed as having initial cerebral hemiplegia by MRI or CT; 2) age 20–70 years old, course of disease within 6 months, with stable vital signs; 3) no balance disorders before this stroke **Exclusion criteria:** 1) serious viscera dysfunction, such as cardiovascular system, lung, liver and kidney; 2) serious joint diseases; 3) history of mental illness or severe cognitive impairment, audiovisual understanding obstacle, unable to cooperate with instructions; and 4) infection and ulcers on skin **Pretreatment:** no significant differences were found between the two groups at baseline ($P > 0.05$). **Sample size calculation:** considering balance disorder is the most common dysfunction after stroke, we calculated the sample size based on the score of the Berg Balance Scale. According to the results of the preliminary experiment, the score of the Berg Balance Scale was increased by 18.1 points in the control group and 22.2 points in the SET group, and the standard deviation of the combination was 4.06. Considering the number of cases that dropped out, the number of cases in each group increased by 20%. Finally it was calculated that 25 cases in each group were required for this project, a total of 50 cases.
Interventions	**Intervention characteristics** Experimental training • Type of intervention: the sling exercise therapy group performed the following four exercises: 1) the patient's bilateral knee joints/feet were suspended by a rope belt, then the patient's pelvis was elevated and maintained in supine or lateral position, adding flexion and extension training to lower limb if permitted; 2) in supine or lateral position, with patient's head, trunk and pelvis fixed, the therapist used appropriate elastic bands to assist patient's limbs to do passive-power assisted-power resistance training in all directions (bending, stretch, outreach, adduction); 3) the patient's chest and

Liu 2020 *(Continued)*

abdomen were suspended by a wide elastic band, he positioned himself in the prone position with the fulcrum of bilateral elbows and knees, then the torso swayed in all directions; therapists could assist; 4) target elbow and wrist were suspended, according to the patient's ability to do passive/active open and close chain movement, supplemented by shoulder loosening technology.

- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 1 session/day, 5 sessions/week, 4 weeks, 30 minutes each session
- Total minutes of intervention: 600
- Total minutes of conventional therapy: not reported
- Content of standard care: routine rehabilitation treatments (e.g. physical factor therapy, occupational therapy, etc.) other than sports training and individualised drug treatment
- Who provided study therapy: therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): no
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): no
- Material used: sling suspension equipment
- Reporting of death and serious adverse events, including falls: no adverse events associated with either intervention were recorded throughout the study.

Control group (same amount of additional therapy)

- Type of intervention: routine physiotherapy including active and passive joint movement, muscle strength training, bridge exercise, balance training in sitting and standing positions, according to the patients' functional state
- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 1 session/day, 5 sessions/week, 4 weeks, 30 minutes each session
- Total minutes of intervention: 600
- Total minutes of conventional therapy: not reported
- Content of standard care: routine rehabilitation treatments (e.g. physical factor therapy, occupational therapy, etc.) other than sports training and individualised drug treatment.
- Who provided study therapy: therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: no adverse events associated with either intervention were recorded throughout the study.

Outcomes	SF-36 bodily pain • Outcome type: continuous outcome SF-36 general health • Outcome type: continuous outcome SF-36 vitality

Liu 2020 *(Continued)*

- Outcome type: continuous outcome

SF-36 social functioning

- Outcome type: continuous outcome

SF-36 mental health

- Outcome type: continuous outcome

Berg Balance Scale

- Outcome type: continuous outcome
- Data value: change from baseline

Barthel Index

- Outcome type: continuous outcome
- Data value: change from baseline

Fugl-Meyer Assessment-upper extremity

- Outcome type: continuous outcome
- Data value: change from baseline

Fugl-Meyer Assessment-lower extremity

- Outcome type: continuous outcome
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "After signing an informed consent form, patients were coded according to their order of entry into the experiment. Each code was matched to a random number generated from a random number table."
Allocation concealment (selection bias)	Unclear risk	Concealment of allocation was not described with enough details.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No blinding of both personnel and participants
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "assessor-blinded randomized"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Judgement comment: no dropouts
Selective reporting (reporting bias)	High risk	Judgement comment: trial registration was available. Timed up and go and Modified Ashworth Score were included in the registration but were not reported in this paper.
Other bias	Low risk	No other potential sources of bias found

Marzouk 2019

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to determine the effect of pelvic control exercises on pelvic asymmetry and its consequence on gait performance in patients with stroke
Participants	**Baseline characteristics** Experimental training (selective-trunk training) • Mean age and standard deviation: not reported • Number of participants: 15 • Sex (women/men): not reported • Type of stroke event (I/H): not reported • Location of stroke event (L/R): not reported • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in days: not reported Control group (only standard care) • Mean age and standard deviation: not reported • Number of participants: 15 • Sex (women/men): not reported • Type of stroke event (I/H): not reported • Location of stroke event (L/R): not reported • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in days: not reported **Inclusion criteria:** the patients were diagnosed by a neurologist and the diagnosis was confirmed by CT scan and/or MRI. Patients' age ranged from 45 to 60 years with BMI less 30 kg/m^2 and duration of stroke ranged from six months to 18 months. All patients were able to walk independently with or without assistive devices. The degree of spasticity of paretic lower limb muscles ranged from (1:1+) according to the Modified Ashworth Scale. **Exclusion criteria:** patients with other neurological diseases, haemorrhagic stroke, significant musculoskeletal abnormalities for both lower limbs, contracture, deformities, cardiovascular or pulmonary diseases, cognitive impairments, Pusher syndrome, visual or auditory impairment were excluded. **Pretreatment:** both groups were matched in the general characteristics including age, height and weight, body mass index and duration of illness ($P > 0.05$). **Sample size calculation:** no statistical calculation
Interventions	**Intervention characteristics** Experimental training (selective-trunk training) • Type of intervention: selective-trunk training: Pelvic tilting exercises and pelvic stabilisation exercises from different positions. Pelvic tilting exercises included: anterior, posterior and lateral pelvic tilting

Marzouk 2019 *(Continued)*

from sitting, sit to standing and pelvic rotation on a therapeutic ball. Pelvic stabilisation exercises included: weight-shifting on the affected limb from standing, ball-bridging, planking and stabilising reversals exercises

- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 3 sessions/week, 6 weeks; 40 minutes each session
- Total minutes of intervention: 720
- Total minutes of conventional therapy: 540
- Content of standard care: the control group was treated by selected physical therapy programme consisting of stretching exercises, facilitation of the weak muscles, strengthening exercises, proprioceptive neuromuscular facilitation and gait training, three sessions per week day after day for successive six weeks. Duration of each session ranged from 25-30 minutes according to the ability of each patient.
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Control group (only standard care)

- Type of intervention: not reported
- Length of intervention in minutes, days, or weeks: not reported
- Total number of repetitions: not reported
- Total minutes of intervention: not reported
- Total minutes of conventional therapy: 540
- Content of standard care: the control group was treated by selected physical therapy programme consisting of stretching exercises, facilitation of the weak muscles, strengthening exercises, proprioceptive neuromuscular facilitation and gait training, three sessions per week day after day for successive six weeks. Duration of each session ranged from 25-30 minutes according to the ability of each patient
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes	Walking speed (m/s) • Outcome type: continuous outcome • Direction: higher is better
Notes	

Risk of bias

Marzouk 2019 *(Continued)*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	No description available in this trial
Allocation concealment (selection bias)	Unclear risk	No description available in this trial
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No description available in this trial
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No description available in this trial
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No description available in this trial
Selective reporting (reporting bias)	Unclear risk	No description available in this trial
Other bias	Unclear risk	No description available in this trial

Merkert 2011

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to investigate the effect of the Vibrosphere®, with its combined vibration therapy and strategic balance training, on trunk stability, muscle tone and postural control in stroke patients compared with those receiving geriatric rehabilitation alone
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 74.5 ± 8.3 • Number of participants: 33 • Sex (women/men): 22/11 • Type of stroke event (I/H): not reported • Location of stroke event (L/R): not reported • Stroke severity at baseline, BI: 43.3 ± 21.4 • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in days: 92.4 ± 284.6 Control group (no additional therapy) • Mean age and SD: 74.5 ± 8.6 • Number of participants: 33

Merkert 2011 *(Continued)*

- Sex (women/men): 22/11
- Type of stroke event (I/H): not reported
- Location of stroke event (L/R): not reported
- Stroke severity at baseline, BI: 40.6 ± 20.8
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in days: 15.9 ± 15.1

Inclusion criteria: paresis or hemiplegia following stroke with decreased stability of the trunk or lower limb and age 60 years and older

Exclusion criteria: thrombosis, acute illness or infections, operations of the spine or lower extremities (including joint replacement) within the past 6 months, implanted pacemakers or defibrillators, severe cognitive impairment or body weight greater than 150 kg

Pretreatment: no statistical differences were observed in the Barthel Index, Berg Balance Scale, and functional test scores for these patients at admission.

Sample size calculation: not calculated

Interventions

Intervention characteristics

Experimental training

- Type of intervention: the intervention group received 15 additional Vibrosphere® training sessions, consisting of two repetitions of three exercises. Supine bridging with Vibrosphere; level 1: holding position without bridging, level 2: intermittent bridging, level 3: continuous bridging (35 Hz/30 s). Seated exercises with Vibrosphere; level 1: sitting with use of armrests, level 2: seated trunk extension and flexion with continuous use of armrests, level 3: seated trunk extension and flexion without use of armrests. Standing training on Vibrosphere; level 1: leaning stance supported by therapist, level 2: upright stance supported by therapist with intermittent leaning, level 3: unsupported upright stance
- Length of intervention in minutes, days, or weeks: 3 weeks
- Total number of repetitions: 15 sessions, 3 exercises, 30 seconds each exercise x 2
- Total minutes of intervention: 2700
- Total minutes of conventional therapy: not reported
- Content of standard care: early post-acute geriatric rehabilitation
- Who provided study therapy: therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): the level of difficulty for each exercise was chosen according to the patient's functional status.
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 8 participants dropped out.
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): no
- Material used: the Vibrosphere
- Reporting of death and serious adverse events, including falls: not reported

Control group (no additional therapy)

- Type of intervention: conventional comprehensive geriatric rehabilitation
- Length of intervention in minutes, days, or weeks: 3 weeks
- Total number of repetitions: not reported
- Total minutes of intervention: not reported
- Total minutes of conventional therapy: not reported
- Content of standard care: early post-acute geriatric rehabilitation

Merkert 2011 *(Continued)*

- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): high dropout rate (10 participants)
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes

Tinetti gait

- Outcome type: continuous outcome
- Range: 0-12
- Direction: higher is better
- Data value: change from baseline

Activities of daily living

- Outcome type: continuous outcome
- Scale: Barthel Index
- Range: 0-100
- Direction: higher is better
- Data value: change from baseline

Walking ability

- Outcome type: continuous outcome
- Scale: TUG (sec)
- Direction: higher is better
- Data value: change from baseline

Standing balance

- Outcome type: continuous outcome
- Scale: Berg Balance Scale
- Range: 0-56
- Direction: higher is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "randomized into two groups." Judgement comment: not enough details were provided.
Allocation concealment (selection bias)	Unclear risk	No details on whether allocation was concealed
Blinding of participants and personnel (performance bias)	Unclear risk	Not described

Merkert 2011 *(Continued)*

All outcomes		
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not described
Incomplete outcome data (attrition bias) All outcomes	High risk	Quote: "Reasons for discontinuation included early dismissal, hospital transfer, and deterioration of patients' health. There were no significant differences between the dropouts for the two groups in terms of age, gender, length of stay, type or number of diagnoses, cognition, and in- or outpatient status. No statistical differences were observed in the Barthel Index, Berg Balance Scale, and functional test scores for these patients at admission." Quote: "the functional tests. Results of the 66 patients enrolled, 48 patients completed the study (25 in the intervention group; 23 in the control group). There was no significant difference". Judgement comment: high dropout rates of 25% and 30% for the intervention and control groups
Selective reporting (reporting bias)	High risk	Judgement comment: no study registration; only significant results were presented in favour of the experimental group.
Other bias	Low risk	No other risk of bias

Mudie 2002

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to investigate which of three treatment approaches might best promote symmetry in sitting and transfer of training to standing. The three approaches were: provision of feedback from the Balance Performance Monitor (BPM) (SMS Technologies Ltd, Harlow, Essex, UK) force platform system, task-specific reach and a Bobath regimen. A secondary aim was to investigate if symmetry-specific training provided greater immediate and long-term improvements than a nonspecific rehabilitation programme.
Participants	**Baseline characteristics** Experimental training (weight-shift training) • Mean age and SD: not reported • Number of participants: 10 • Sex (women/men): not reported • Type of stroke event (I/H): not reported • Location of stroke event (L/R): not reported • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 2-6 weeks post-stroke Experimental training (sitting-reaching training) • Mean age and SD: not reported • Number of participants: 10

Mudie 2002 *(Continued)*

- Sex (women/men): not reported
- Type of stroke event (I/H): not reported
- Location of stroke event (L/R): not reported
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 2-6 weeks post-stroke

Experimental group (selective-trunk training)

- Mean age and SD: not reported
- Number of participants: 10
- Sex (women/men): not reported
- Type of stroke event (I/H): not reported
- Location of stroke event (L/R): not reported
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 2-6 weeks post-stroke

Control group (no additional therapy)

- Mean age and SD: not reported
- Number of participants: 10
- Sex (women/men): not reported
- Type of stroke event (I/H): not reported
- Location of stroke event (L/R): not reported
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 2-6 weeks post-stroke

Overall

- Mean age and SD: 72.4 ± 9.01
- Number of participants: 40
- Sex (women/men): 19/21
- Type of stroke event (I/H): 29/11
- Location of stroke event (L/R): 22/18
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 2-6 weeks post-stroke

Inclusion criteria: suffered a recent stroke, bore the majority of their weight consistently to one side in sitting, and cognitive screening scores indicated a capacity for relearning

Exclusion criteria: pain, existing comorbidities that could compromise the response to training, experience of previous balance retraining

Pretreatment: there was no significant difference between the admission total and mobility (Barthel Index) scores or age.

Mudie 2002 *(Continued)*

Sample size calculation: not calculated

Interventions	**Intervention characteristics** Experimental training (weight-shift training) • Type of intervention: A portable computer-linked Balance Performance Monitor feedback console was used to provide awareness of weight distribution during training in sitting. Visual information on weight distribution was provided by horizontal and vertical sets of coloured lights grading from green when weight was distributed evenly, through orange to red when weight was borne asymmetrically in the outer limits of the base of support. Visual rather than auditory signals from the Balance Performance Monitor were used during training. The participant was required to displace weight to either side whilst reaching to touch a target with the non-paretic hand at various heights and distances. The participant monitored weight shift during reaching and attempted to return to a symmetrical position after reaching. When this was easily achievable, the feedback monitor was screened from the participant, allowing feedback only to the therapist. At this stage, the participant attempted to distribute weight appropriately during reaching and return to a symmetrical position without visual feedback. Visual feedback was reintroduced if the error was substantial. For the two-week training period, feedback and non-feedback trials were interspersed. • Length of intervention in minutes, days, or weeks: 2 weeks • Total number of repetitions: 5 sessions/ week, 2 weeks, 30 minutes each session • Total minutes of intervention: 300 • Total minutes of conventional therapy: not reported • Content of standard care: standard physiotherapy and occupational therapy • Who provided study therapy: staff occupational therapists • How provided (face-to-face, internet, telephone, individual, in group): face-to-face • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): no • Modification (intervention was modified during the course of the study?): no • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 2 dropouts • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported • Material used: balance performance monitor (SMS Technologies Ltd, Harlow, Essex, UK) force platform system • Reporting of death and serious adverse events, including falls: not reported Experimental training (sitting-reaching training) • Type of intervention: for task-related reach training, the participant was seated on an adjustable plinth, with feet on the floor. Fifteen grocery items were placed either behind or to the side of the participant or on the floor at approximately 140% of arm' s length to encourage a range of weight shift to either side. These items were retrieved singly with the non-paretic upper limb and placed on the cupboard shelves at various heights and distances. The cupboard was of sufficient height and depth to allow reaching to the extremes of the seated base of support to place groceries on shelves. Task-specific reaching and Balance Performance Monitor training were conducted by staff occupational therapists. • Length of intervention in minutes, days, or weeks: 2 weeks • Total number of repetitions: 5 sessions/ week, 2 weeks, 30 minutes each session • Total minutes of intervention: 300 • Total minutes of conventional therapy: not reported • Content of standard care: standard physiotherapy and occupational therapy • Who provided study therapy: staff occupational therapists • How provided (face-to-face, internet, telephone, individual, in group): face-to-face • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): no • Modification (intervention was modified during the course of the study?): no

Mudie 2002 *(Continued)*

- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 0 dropouts
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: adjustable plinth, fifteen grocery items
- Reporting of death and serious adverse events, including falls: not reported

Experimental group (selective-trunk training)

- Type of intervention: a treatment protocol (obtainable from the authors) based on Bobath practices was devised by the Bobath-trained staff physiotherapists who trained the third group. This protocol focused on increasing trunk and pelvic range of movement, normalising trunk muscle tone, maintaining appropriate balance responses during reaching and improving the participant's ability to move in and out of an asymmetric postural set. A series of postures and postural manoeuvres involving lateral weight shift, lateral, anterior and posterior pelvic tilting and isolated trunk movements were verbally and manually facilitated by the therapist during reaching in seated or lying down positions. These manoeuvres were repeated throughout the session to encourage participants' awareness of normal posture and weight distribution.
- Length of intervention in minutes, days, or weeks: 2 weeks
- Total number of repetitions: 5 sessions/week, 2 weeks, 30 minutes each session
- Total minutes of intervention: 300
- Total minutes of conventional therapy: not reported
- Content of standard care: standard physiotherapy and occupational therapy
- Who provided study therapy: Bobath-trained staff physiotherapists
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): no
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 1 dropout
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Control group (no additional therapy)

- Type of intervention: only standard care
- Length of intervention in minutes, days, or weeks: 2 weeks
- Total number of repetitions: not reported
- Total minutes of intervention: not reported
- Total minutes of conventional therapy: not reported
- Content of standard care: standard physiotherapy and occupational therapy
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 4 dropouts
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes	Activities of daily living

Mudie 2002 *(Continued)*

- Outcome type: continuous outcome
- Scale: Barthel Index
- Range: 0-100
- Direction: higher is better
- Data value: change from baseline

Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Forty numbers from a random numbers table were sequentially drawn from a box by a clinician independent of the study. The numbers were written alternately in columns headed with the training regimes of the four groups until all 40 numbers were placed."
Allocation concealment (selection bias)	Low risk	Quote: "The slips of paper containing the random numbers were replaced in an opaque canister that was kept in a locked ling cabinet in the senior investigator's office. On admission of a patient to the study, an independent person drew a number from the container and the patient was allocated to the treatment group with the matching number."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not described
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not described
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not described
Selective reporting (reporting bias)	Unclear risk	Judgement comment: no study registration and P values were available
Other bias	Low risk	No other potential sources of bias found

Park 2013

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to examine the potential benefits of exercise using a horseback riding simulator on the postural balance of chronic stroke patients
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 56.09 ± 7.22 • Number of participants: 34

Park 2013 *(Continued)*

- Sex (women/men): 16/18
- Type of stroke event (I/H): 15/19
- Location of stroke event (L/R): not reported
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: the onset of stroke was between 7 and 12 months prior to the experiment in 19 patients, and more than 15 months prior in 15 patients.

Control group (same amount of additional therapy)

- Mean age and SD: 51.55 ± 8.27
- Number of participants: 33
- Sex (women/men): 15/18
- Type of stroke event (I/H): 16/17
- Location of stroke event (L/R): not reported
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: the onset of stroke was between 7 and 12 months prior to the experiment in 20 patients and more than 13 months prior in 13 patients.

Inclusion criteria: No patient had diabetes, heart disease, or orthopaedic problems and their MMSE-K score was 24 or higher. The participants were able to walk independently for more than 15 minutes. They were able to maintain a standing position independently for more than 30 seconds and could walk indoors continuously for more than 30 m independently. Also, they had no problems with walking due to orthopaedic surgery or impairment, a Modified Ashworth Scale stiffness of 2 or less and a lower extremity muscle strength measured as F or higher in the Manual Muscle Test.

Exclusion criteria: not described

Pretreatment: not evaluated

Sample size calculation: not calculated

Interventions	**Intervention characteristics** Experimental training • Type of intervention: the HEG used a horseback riding simulator (FORTIS, Korea) with a shape and size similar to those of a real horse (FORTIS, Korea). The simulator had 100 different exercise programmes. Since the participants were patients, course number 71 was selected as it did not include abrupt rhythm and had a comfortable up and down and forward and backward rhythmic movement (the distance between up and down was 52 m/min, the distance between forward and backward was 39 m/min, the number of up and down rhythmic movements was 90 to 100 times, the number of forward and backward rhythmic movements was 90 to 100 times, and the rhythm distance was 65 m/min). Course number 74 was also selected as it had a large up and down and forward and back-ward rhythmic movement, which has a good exercise effect on the neck, shoulders, trunk, abdomen, thighs, and legs (distance between up and down was 73 m/min, distance between forward and backward was 40 m/min, the number of up and down rhythmic movements was 95 to 105 times, the number of forward and backward rhythmic movements was 95 to 105 times, and the rhythm distance was 98 m/min). Each course was administered for 15 minutes and the participants rested for five minutes after a course. The exercise speed was set at a medium speed (50%), which was not fast when compared to the designated rhythmic speeds of the horseback riding simulator. The risk of falling was minimised by equipping the participants with an automatic stop device. • Length of intervention in minutes, days, or weeks: 8 weeks • Total number of repetitions: 3 sessions/week, 8 weeks, 35 minutes each session

Park 2013 *(Continued)*

- Total minutes of intervention: 840
- Total minutes of conventional therapy: 6 x 8
- Content of standard care: not reported
- Who provided study therapy: a physical therapist with more than 10 years of clinical experience
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): no
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): no
- Material used: horseback riding simulator with a shape and size similar to those of a real horse (FORTIS, Korea)
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: the mat exercise group performed a trunk stabilisation exercise using a mat for 35 minutes. The trunk stabilisation exercises were performed using the lumbar spinal stabilisation exercise methods developed by Norris and Richardson and Jull. The exercise session lasted 35 minutes in total, and warm-up and cool-down exercises were performed for five minutes at the beginning and the end of the exercises, respectively. Programmes 1 through 3 were repeated 10 times per set and a total of three sets were completed.
- Length of intervention in minutes, days, or weeks: 8 weeks
- Total number of repetitions: 3 sessions/week, 8 weeks, 35 minutes each session
- Total minutes of intervention: 840
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: a physical therapist with more than 10 years of clinical experience
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): no
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes

Standing balance

- Outcome type: continuous outcome
- Scale: Berg Balance Scale
- Range: 0-56
- Direction: higher is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement

Park 2013 *(Continued)*

Random sequence generation (selection bias)	Unclear risk	From details of the study, we were not able to reproduce randomisation.
Allocation concealment (selection bias)	Unclear risk	From details of the study, we could not conclude if randomisation was concealed.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not clear from the description if there was any blinding
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not clear from the description if there was any blinding
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Judgement comment: no details on dropouts or a flow chart
Selective reporting (reporting bias)	Low risk	Judgement comment: no registration was available. However, non-significant results were presented in the manuscript.
Other bias	Unclear risk	Not clear from the description if other biases were ruled out

Park 2018a

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to compare the effects of NMES to abdominal and back muscles on postural balance in post-stroke hemiplegic patients
Participants	**Baseline characteristics** Experimental training (electrostimulation) • Mean age and SD: 59.4 ± 11.74 • Number of participants: 10 • Sex (women/men): 4/6 • Type of stroke event (I/H): 7/3 • Location of stroke event (L/R): 4/6 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in days: 16.5 ± 8.18 Experimental training (electrostimulation back muscles) • Mean age and SD: 68.6 ± 13.57 • Number of participants: 10 • Sex (women/men): 4/6 • Type of stroke event (I/H): 6/4 • Location of stroke event (L/R): 2/8

Park 2018a *(Continued)*

- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in days: 17.3 ± 9.12

Control group (same amount of additional therapy)

- Mean age and SD: 57.5 ± 11.84
- Number of participants: 10
- Sex (women/men): 1/9
- Type of stroke event (I/H): 7/3
- Location of stroke event (L/R): 6/4
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in days: 13.6 ± 5.52

Inclusion criteria: (1) participants who were diagnosed with stroke, indicated by magnetic resonance imaging or computed tomography, and an onset time of less than 6 months; (2) participants who had no previous history of stroke; and (3) participants who maintained static sitting balance for more than 5 minutes

Exclusion criteria: (1) patients with vestibular, orthopaedic, medical or other neurologic conditions affecting postural stability; (2) patients who were uncooperative because of severe aphasia or cognitive impairment; (3) patients with uncontrolled medical conditions; (4) patients with neglect syndromes; and (5) patients with implanted pacemakers of defibrillators

Pretreatment: no significant differences were detected in demographic or clinical characteristics of participants between the groups (P > 0.05).

Sample size calculation: the sample size was calculated using the G*Power version3.1.9.2 (http://www.gpower.hhu.de/). The power was set at 0.80, with an alpha of 0.05, and effect size 0.70. Assuming an attrition rate of 20%, an estimated total sample size of 30 (10 per group) was needed.

Interventions

Intervention characteristics

Experimental training (electrostimulation)

- Type of intervention: neuromuscular electrical stimulation was administered at 30–70 mA intensity, 250 ms pulse width, and 35 Hz frequency for 10 seconds followed by a pause of 12 seconds to the abdominal muscles. The intensity of stimulation was set to the maximum amount at which patients felt muscle contractions without pain sensation or fatigue. In group A, electrodes were attached 1 cm superior to the iliac crest along the mid-axillary line, and 2 cm superior and 2 cm medial to the anterior superior iliac spine, bilaterally. Core muscle strengthening exercise consisted of the following exercises, listed by position: (1) supine position — bridge exercise,segmental rotation, dead bug exercise; (2) prone position — plank exercise, belly blaster, bird dog exercise; and (3) lateral position — side plank exercise, side bridge exercise
- Length of intervention in minutes, days, or weeks: 3 weeks
- Total number of repetitions: 5 days/week, 3 weeks, 30 minutes per session
- Total minutes of intervention: 450
- Total minutes of conventional therapy: not reported
- Content of standard care: conventional stroke rehabilitation programme consisting of physical and occupational therapy including a range of motion exercises, aerobic exercise, strengthening exercise, sitting and standing balance training using mirror or balance board, basic and instrumental ADL training, progressive gait and functional ambulation training. Cognitive or speech therapy was added as needed.
- Who provided study therapy: not reported

Park 2018a *(Continued)*

- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): exercise intensity was increased gradually according to the patients' individual levels of tolerance.
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 1 dropout
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: neuromuscular electrical stimulation (Microstim; SejinMT Co Ltd, Seoul, Korea)
- Reporting of death and serious adverse events, including falls: all participants completed the entire study without any side effects associated with the intervention.

Experimental training (electrostimulation back muscles)

- Type of intervention: neuromuscular electrical stimulation (Microstim; SejinMT Co Ltd, Seoul, Korea) was administered at 30–70 mA intensity, 250 ms pulse width, and 35 Hz frequency for 10 seconds followed by a pause of 12 seconds to the back muscles (group B) during the core muscle-strengthening exercise. The intensity of stimulation was set to the maximum amount at which patients felt muscle contractions without pain sensation or fatigue. In group B, electrodes were attached to the bilateral thoracic erector spinae (5 cm lateral to the T6 spinous process) and lumbar erector spinae (2 cm lateral to the L5 spinous process). All electrodes measured 5 × 5 cm in size. The core muscle-strengthening exercise programme consisted of the following exercises, listed by position: (1) supine position — bridge exercise, segmental rotation, dead bug exercise; (2) prone position — plank exercise, belly blaster, bird dog exercise; and (3) lateral position — side plank exercise, side bridge exercise.
- Length of intervention in minutes, days, or weeks: 3 weeks
- Total number of repetitions: 5 days/week, 3 weeks, 30 minutes per session
- Total minutes of intervention: 450
- Total minutes of conventional therapy: not reported
- Content of standard care: conventional stroke rehabilitation programme consisting of physical and occupational therapy including range of motion exercises, aerobic exercise, strengthening exercise, sitting and standing balance training using mirror or balance board, basic and instrumental ADL training, progressive gait and functional ambulation training. Cognitive or speech therapy was added as needed.
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): exercise intensity was increased gradually according to the patients' individual levels of tolerance.
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 1 dropout
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: neuromuscular electrical stimulation (Microstim; SejinMT Co Ltd, Seoul, Korea)
- Reporting of death and serious adverse events, including falls: all participants completed the entire study without any side effects associated with the intervention.

Control group (same amount of additional therapy)

- Type of intervention: core muscle strengthening exercise consisted of the following exercises, listed by position: (1) supine position — bridge exercise, segmental rotation, dead bug exercise; (2) prone position — plank exercise, belly blaster, bird dog exercise; and (3) lateral position — side plank exercise, side bridge exercise
- Length of intervention in minutes, days, or weeks: 3 weeks
- Total number of repetitions: 5 days/week, 3 weeks, 30 minutes per session
- Total minutes of intervention: 450
- Total minutes of conventional therapy: not reported

Park 2018a *(Continued)*

- Content of standard care: conventional stroke rehabilitation programme consisting of physical and occupational therapy including range of motion exercises, aerobic exercise, strengthening exercise, sitting and standing balance training using mirror or balance board, basic and instrumental ADL training, progressive gait and functional ambulation training. Cognitive or speech therapy was added as needed.
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): exercise intensity was increased gradually according to the patients' individual levels of tolerance
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 0 dropouts
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: all participants completed the entire study without any side effects associated with the intervention.

Outcomes	Standing balance • Outcome type: continuous outcome • Scale: Berg Balance Scale • Range: 0-56 • Direction: higher is better • Data value: change from baseline Trunk function • Outcome type: continuous outcome • Scale: TIS 1.0 • Range: 0-23 • Direction: higher is better • Data value: change from baseline Activities of daily living • Outcome type: continuous outcome • Scale: Barthel Index • Range: 0-100 • Direction: higher is better • Data value: change from baseline
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "A total of 32 subjects were randomly assigned to three groups by selecting the card with the group number in the invisible box".
Allocation concealment (selection bias)	Unclear risk	Not clear from the description if allocation was concealed.
Blinding of participants and personnel (performance bias)	High risk	Not blinded.

Park 2018a *(Continued)*

All outcomes		
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Quote: "All outcome measurements were assessed just before and 3 weeks after intervention."
Incomplete outcome data (attrition bias) All outcomes	Low risk	One participant from group A dropped out due to aspiration pneumonia, and a follow-up loss in group B occurred due to early discharge before the study completion.
Selective reporting (reporting bias)	Unclear risk	No registration available; only significant results were reported.
Other bias	Low risk	No other potential sources of bias found.

Park 2018b

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to identify an effective interventional method for the rehabilitation of stroke patients by identifying the effects of TENS on trunk control and gait ability in stroke patients when applied simultaneously with chest expansion exercise
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 62.00 ± 10.36 • Number of participants: 7 • Sex (women/men): 1/6 • Type of stroke event (I/H): not reported • Location of stroke event (L/R): not reported • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 11.86 ± 3.02 Control group (same amount of additional therapy) • Mean age and SD: 66.71 ± 5.02 • Number of participants: 7 • Sex (women/men): 2/5 • Type of stroke event (I/H): not reported • Location of stroke event (L/R): not reported • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 12.43 ± 2.99 **Inclusion criteria:** diagnosed with stroke 6 months ago, no congenital deformity in the chest, a score of 24 points in the MMSE-K, no serious abnormality in the pin prick test, ability to walk 20 m independent-

Park 2018b *(Continued)*

ly without aids, ability to hold a standing posture for 30 seconds or more, and the absence of skin disease

Exclusion criteria: not described

Pretreatment: not evaluated

Sample size calculation: not described

Interventions

Intervention characteristics

Experimental training

- Type of intervention: for the chest expansion exercise with TENS: for the chest expansion exercise, 3–5 ribs or 7–9 ribs on the non-paretic side were manually contracted and a quick stretch was applied at the end of the exhalation. When the chest became swollen on the non-paretic side during inhalation, resistance in the opposite direction was provided by the therapist's hand. For certain parts of this study, TENS (Novastim CU-FS1, CU Medical Systems, Korea) was applied. TENS (frequency: 0–100Hz; pulse width: 20–700 μs) provided a stimulus that the participants could easily feel, and the level of stimulation was increased until just prior to muscle contraction. To each participant, a pair of electrodes was attached to the latissimus dorsi muscle and the external oblique muscle. The intervention time was 30 min and TENS was applied simultaneously with the chest expansion exercise.
- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 5 sessions/week, 4 weeks, 30 minutes per session
- Total minutes of intervention: 600
- Total minutes of conventional therapy: 600
- Content of standard care: general exercise therapy, including mat exercise and gait exercise
- Who provided study therapy: physical therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): no
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 1 dropout
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): no
- Material used: transcutaneous electrical nerve stimulation (Novastim CU-FS1, CU Medical Systems, Korea)
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: for the chest expansion exercise, 3–5 ribs or 7–9 ribs on the non-paretic side were manually contracted and a quick stretch was applied at the end of the exhalation. When the chest became swollen on the non-paretic side during inhalation, resistance in the opposite direction was provided by the therapist's hand.
- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 5 sessions/week, 4 weeks, 30 minutes per session
- Total minutes of intervention: 600
- Total minutes of conventional therapy: 600
- Content of standard care: general exercise therapy, including mat exercise and gait exercise
- Who provided study therapy: physical therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): no
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 1 dropout

Park 2018b *(Continued)*

- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes	Tinetti gait • Outcome type: continuous outcome • Direction: higher is better • Range: 0-12 • Data value: change from baseline Trunk function • Outcome type: continuous outcome • Scale: TIS 1.0 • Range: 0-23 • Direction: higher is better • Data value: change from baseline Walking ability • Outcome type: continuous outcome • Scale: Six-minute walk test (m) • Direction: higher is better • Data value: change from baseline
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	From the details in the study, we could not reproduce randomisation.
Allocation concealment (selection bias)	High risk	Allocation was not concealed.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not described if personnel or participants were blinded
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not described if assessor was blinded
Incomplete outcome data (attrition bias) All outcomes	High risk	The study authors did not report any dropouts or the reason for possible dropouts.
Selective reporting (reporting bias)	Unclear risk	No registration available
Other bias	Unclear risk	No clearly described if there were any other forms of biases

Park 2020

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to investigate the effect of diagonal pattern training in the sitting position to improve trunk control ability for balance and gait in stroke-affected patients
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 67.43 ± 4.74 • Number of participants: 21 • Sex (women/men): 5/16 • Type of stroke event (I/H): 12/9 • Location of stroke event (L/R): 13/8 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 13.00 ± 2.68 Control group (same amount of additional therapy) • Mean age and SD: 67.57 ± 3.28 • Number of participants: 21 • Sex (women/men): 7/14 • Type of stroke event (I/H): 11/10 • Location of stroke event (L/R): 11/10 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: 13.48 ± 2.82 **Inclusion criteria:** (1) had been diagnosed with a stroke on MRI for more than 6 months, (2) were aged 45–70 years, (3) had a MMSE-K score of 24 or higher, (4) Brunnstrom scale score of 4 or higher, (5) had a modified Ashworth scale score for elbow flexion and shock of 1+ or less, (6) and consented to participate in the study after receiving a clear explanation of the purpose and characteristics of this clinical trial **Exclusion criteria:** (1) sensory ataxia or cerebellar ataxia, (2) neglect, (3) coronary heart disease (CHD) or peripheral arterial disease, (4) cardiorespiratory problems, and (5) spine surgery **Pretreatment:** no significant differences at baseline **Sample size calculation:** the sample size of this study was determined using G-power software (G* Power 3.1.9.2, Heinrich-Heine-Universität, Düsseldorf, Germany). First, a pilot study was conducted in 12 stroke patients to determine the effect size. Using the independent sample t-test, a total of 42 study participants were required, as 21 experiment participants and 21 control participants, where the effect size was 0.90, significance level was 0.05, and the power was 0.80.
Interventions	**Intervention characteristics** Experimental training

Park 2020 *(Continued)*

- Type of intervention: diagonal pattern training was modified with chopping and lifting pattern of the proprioceptive neuromuscular facilitation (PNF) technology to create 10 movements. All the movements were performed in a sitting position on a height-adjustable mat and 10 fingers were crossed with each other for the movement of the paralysed hand. In the single plane motion, 10 movements were grouped into five items. The training was carried out for 1 min per item. Additionally, a 30 s break was provided. All the five items of diagonal pattern training were performed as 1 set. The rest between each set was 150 s and the total training time was 30 min when 3 sets were performed. The participants were asked to continuously look at the ends of the two clasped hands moving diagonally during the training procedure.
- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 20 session in 4 weeks, 30 minutes/session
- Total minutes of intervention: 600
- Total minutes of conventional therapy: not mentioned.
- Content of standard care: general treatment
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): no
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): 1 patient was removed during the intervention.
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: in the single plane motion, 10 movements were grouped into five items.
- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 20 session in 4 weeks, 30 minutes/session
- Total minutes of intervention: 600
- Total minutes of conventional therapy: not mentioned
- Content of standard care: general treatment
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): no
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): 1 patient was discharged from the control group.
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes

Trunk function

- Outcome type: continuous outcome
- Scale: TIS 1.0
- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Walking ability

Park 2020 *(Continued)*

- Outcome type: continuous outcome
- Scale: 10-Meter Walk Test (s)
- Direction: lower is better
- Data value: change from baseline

Standing balance

- Outcome type: continuous outcome
- Scale: Berg Balance Scale
- Range: 0-56
- Direction: higher is better
- Data value: change from baseline

Gait speed (m/s)

- Outcome type: continuous outcome
- Direction: higher is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "The subjects considered to be suitable for this study were randomly assigned (randomization website: http://www.randomization.com) to the experiment group (diagonal pattern training) and the control group (single plane training)."
Allocation concealment (selection bias)	Unclear risk	Quote: "The experiment group was assigned using random numbers obtained through a computer program for random selection." Judgement comment: There is insufficient info here to make a judgement.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not clear if there was any blinding
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not clear if there was any blinding
Incomplete outcome data (attrition bias) All outcomes	High risk	Judgement comment: 1 dropout in each group; the reasons for dropout were not clearly described.
Selective reporting (reporting bias)	Unclear risk	Judgement comment: no study registration; all outcomes were significant.
Other bias	Low risk	No other potential sources of bias found

Park J 2017

Study characteristics

Park J 2017 *(Continued)*

Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to determine the effects of an actual boxing programme on the changes in upper limb function, balance, gait, and quality of life in chronic stroke patients
Participants	**Baseline characteristics** Experimental training • Mean age and SD: not reported • Number of participants: 13 • Sex (women/men): not reported • Type of stroke event (I/H): not reported • Location of stroke event (L/R): not reported • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: not reported Control group (same amount of additional therapy) • Mean age and SD: not reported • Number of participants: 13 • Sex (women/men): not reported • Type of stroke event (I/H): not reported • Location of stroke event (L/R): not reported • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: not reported **Inclusion criteria:** the selection criteria for the participants of this study included individuals with hemiplegia due to stroke, stroke onset within 6 months to minimise the possibility of natural recovery, a score of > 21 points on the MMSE-K, ability to independently walk 10 m, and the ability to understand the research purpose and agree to participate in the study **Exclusion criteria:** individuals who had participated in a similar experiment in the past 6 months, individuals with complaints of back and shoulder pain, and individuals who could not walk 10 m **Pretreatment:** not evaluated **Sample size calculation:** not calculated
Interventions	**Intervention Characteristics** Experimental training • Type of intervention: boxing programme: the programme started with a warm-up session involving breathing and stretching of the trunk and limbs for 5 minutes over 6 weeks (3 times/week). The programme then included mitt hitting and sand bag hitting for 10 minutes, with a 2-minute rest period. Thereafter, stretching of the trunk and limbs was performed for 5 minutes, similar to the warm-up. Before the experiment, patients were trained to wear gloves in the sitting position, and hit mitts and a sand bag in various directions (up, down, left, and right) by applying gestures including jab, straight, one two, and a combination of these. The training was conducted in the sitting position in the first and second week. In the third and fourth week, the training was conducted below the hips. Subsequently, during the fifth and sixth week, the participants were asked to hit the target while sitting and standing. • Length of intervention in minutes, days, or weeks: 6 weeks

Park J 2017 *(Continued)*

- Total number of repetitions: 3 sessions/week, 6 weeks, 30 minutes per session
- Total minutes of intervention: 540
- Total minutes of conventional therapy: not reported
- Content of standard care: Conventional physical therapy involves resistance exercises and gait training performed by a physical therapist. during the 30-minute conventional physical therapy session, neurodevelopmental treatment (NDT) and proprioceptive neuromuscular facilitation (PNF) were performed for 15 minutes each.
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): no
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): two people, including 1 case of voluntary dropout and 1 case of discharge, were excluded from the boxing programme group.
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: gloves, sand bag
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: not reported
- Length of intervention in minutes, days, or weeks: not reported
- Total number of repetitions: not reported
- Total minutes of intervention: not reported
- Total minutes of conventional therapy: 540
- Content of standard care: conventional physical therapy involves resistance exercises and gait training performed by a physical therapist. During the 30-minute conventional physical therapy session, neurodevelopmental treatment (NDT) and proprioceptive neuromuscular facilitation (PNF) were performed for 15 minutes each.
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 2 individuals were discharged in the conventional physical therapy group, and were excluded from the analysis.
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes

Standing balance

- Outcome type: continuous outcome
- Scale: Berg Balance scale
- Range: 0-56
- Direction: higher is better
- Data value: change from baseline

Arm-hand function

- Outcome type: continuous outcome
- Scale: Manual function test-total

Park J 2017 *(Continued)*

- Range: 0-32
- Direction: higher is better
- Data value: change from baseline

Walking ability

- Outcome type: continuous outcome
- Scale:10-Meter Walk Test (s)
- Direction: lower is better
- Data value: change from baseline

Quality of life

- Outcome type: continuous outcome
- Scale: Stroke-Specific Quality of Life
- Range: 49-245
- Direction: higher is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote:"Twenty-six participants were randomly allocated to a boxing group and control group after the upper limb function, balance, gait, and quality of life were recorded", and 13 people each were allocated to the boxing programme group and conventional physical therapy group through a random draw in order to minimise any bias. Each exercise programme was performed.
Allocation concealment (selection bias)	Unclear risk	Not described by the study authors
Blinding of participants and personnel (performance bias) All outcomes	High risk	Each exercise programme was performed over 6 weeks, and the patients were repeatedly educated regarding the training method 1 week before the experiment so that the participants could understand and participate in the boxing programme.
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not described by the study authors
Incomplete outcome data (attrition bias) All outcomes	Low risk	Two people, including 1 case of voluntary dropout and 1 case of discharge, were excluded from the boxing programme group. Moreover, 2 individuals were discharged in the conventional physical therapy group, and were excluded from the analysis.
Selective reporting (reporting bias)	Low risk	No registration was available; both significant and insignificant results were available.
Other bias	Unclear risk	Not clear if any other forms of biases were reduced to permit 'low risk' or 'high risk'

Rangari 2020

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to compare the effect of core strengthening exercises on Swiss ball and mat, to improve trunk balance in hemiplegic patients following stroke
Participants	**Baseline characteristics** Experimental training • Mean age and SD: not reported • Number of participants: 35 • Sex (women/men): not reported • Type of stroke event (I/H): not reported • Location of stroke event (L/R): not reported • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: not reported Control group (same amount of additional therapy) • Mean age and SD: not reported • Number of participants: 35 • Sex (women/men): not reported • Type of stroke event (I/H): not reported • Location of stroke event (L/R): not reported • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: not reported **Inclusion criteria:** patients suffered from first episode of stroke within 1-3 months of duration, age between 40 to 60 years, stage 2, on the Modified Ashworth Scale, no visual and sensory deficits, ability to communicate verbally **Excluded criteria:** the existence of any other neurological or orthopaedic diseases, haemorrhagic stroke, patients having cognitive problems **Pretreatment:** no baseline evaluation was conducted in this study. **Sample size calculation:** not calculated
Interventions	**Intervention characteristics** Experimental training • Type of intervention: core strengthening exercise on Swiss ball; supine-lying exercises: bridging, unilateral bridging, lower trunk rotations. Sitting exercises: static sitting balance, forward trunk flexion, lateral trunk flexion, trunk rotations in sitting, weight shifts, forward reach, lateral reach, perturbations, sit to stand • Length of intervention in minutes, days, or weeks: 6 weeks • Total number of repetitions: 45-60 minutes per session, 5 times a week for 6 weeks • Total minutes of intervention: 1350-1800 • Total minutes of conventional therapy: 450

Rangari 2020 *(Continued)*

- Content of standard care: active assisted range of motion exercise of upper limb (15 times each movement) - shoulder, elbow and wrist and finger range of motion exercise. Lower limb (15 times each movement) - hip, knee and ankle range of motion exercise
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): participants were permitted to take rest for 2 minutes in the middle of each new exercise or as and when he/she wished.
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: physio ball
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: supine-lying position - core strengthening exercise on mat was done in crook lying position, upper trunk in flexion, upper trunk diagonal rotation. Common mat activities: rolling - from the supine-lying to prone-lying: flexion/abduction pattern of upper-limb, flexion/abduction pattern of lower-limb. From prone-lying to supine-lying - flexion/abduction pattern of upper limb to roll from prone-lying to supine-lying. Bridging, unilateral pelvic bridging, upper trunk rotation, lower trunk rotation, prone on elbow, quadruped position, kneel sitting, kneel standing, half kneeling
- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 45-60 minutes per session, 5 times a week for 6 weeks
- Total minutes of intervention: 1350-1800
- Total minutes of conventional therapy: 450
- Content of standard care: active assisted range of motion exercise of upper limb (15 times each movement) - shoulder, elbow and wrist and finger range of motion exercise. Lower limb (15 times each movement) - hip, knee and ankle range of motion exercise
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): participants were permitted to take rest for 2 minutes in the middle of each new exercise or as and when he/she wished.
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: mat
- Reporting of death and serious adverse events, including falls: not reported

Outcomes

Brunel Balance Assessment

- Outcome type: continuous outcome
- Data value: at 1 week and at 1 month

Trunk function

- Outcome type: continuous outcome
- Scale: TIS 1.0
- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Rangari 2020 *(Continued)*

	Activities of daily living • Outcome type: continuous outcome • Scale: Barthel Index • Range: 0-100 • Direction: higher is better • Data value: change from baseline
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Patients were distributed in two groups with 35 subjects in each group respectively and were chosen randomly." Judgement comment: no details on the method of randomisation were provided.
Allocation concealment (selection bias)	Unclear risk	Not clearly described
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not described if participants and personnel were blinded
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not described if assessor was blinded
Incomplete outcome data (attrition bias) All outcomes	High risk	The study authors did not report any dropouts or the reason for possible dropouts.
Selective reporting (reporting bias)	Unclear risk	No registration available; only a few outcome measures were reported.
Other bias	Unclear risk	Not clear if any other forms of biases were reduced to permit 'low risk' or 'high risk'

Renald 2016

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to compare the efficacy of trunk exercises performed on Swiss ball versus bed in trunk control among hemiparetic patients
Participants	**Baseline characteristics** Experimental training • Mean age and SD: not reported • Number of participants: not reported

Renald 2016 *(Continued)*

- Sex (women/men): not reported
- Type of stroke event (I/H): not reported
- Location of stroke event (L/R): not reported
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: not reported

Control group (same amount of additional therapy)

- Mean age and SD: not reported
- Number of participants: not reported
- Sex (women/men): not reported
- Type of stroke event (I/H): not reported
- Location of stroke event (L/R): not reported
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: post stroke duration of less than 1 month

Inclusion criteria: acute ischaemic in the middle cerebral artery stroke patients with age between 45 to 60 years and with post-stroke duration of less than 1 month. The Mini Mental Status Scales score was 24 or above. The patient should be able to sit for 1 minute unsupported on a stable surface and the patient should be able to understand and follow simple verbal instructions.

Exclusion criteria: obesity of participants, patients (BMI > 30), neurological disease affecting balance other than stroke such as cerebellar disease, Parkinson's disease, vestibular lesion and musculoskeletal diseases such as low back ache, arthritis, degenerative diseases of the lower limbs affecting motor performance

Pretreatment: not evaluated

Sample size calculation: not calculated

Interventions	**Intervention Characteristics** Experimental training • Type of intervention: patients performed a set of trunk exercises using a Swiss ball. The exercises were performed in supine lying and sitting position. Pelvic bridging: in supine lying, both the patient's legs are placed on a Swiss ball and asked to lift the pelvis off the support surface. Initially the ball was kept beneath the knees and advanced to the lower leg. Unilateral bridging: was performed by lifting the uninvolved leg off the ball while maintaining the pelvic bridge position. Trunk rotation: was performed by placing both the patient's legs on the Swiss ball and he/she was asked to move the ball to both the left and the right by rotating the pelvis. Initially the ball was placed beneath the knees, and then advanced towards the ankles. Static sitting balance: the patient was seated on the Swiss ball with hips and knee bent at 90 degrees and the feet kept flat on the support surface. Trunk flexion-extension: the patient flexes and extends the trunk without moving the trunk forwards or backwards. Trunk lateral flexion: Upper trunk lateral flexion: was executed by initiating movement from the shoulder girdle so as to bring the elbow towards the ball. Lower trunk lateral flexion: was achieved by initiating movement from the pelvic girdle so as to lift the pelvis off the ball and bring it towards the ribcage. Trunk rotation: Upper trunk rotation: was performed by moving each shoulder forwards and backwards. Lower trunk rotation: was performed by moving each knee forwards and backwards. Forward reach: was performed by asking the patient to reach a fixed point at shoulder height by forward flexing the trunk at the hips. Lateral reach: was performed by asking the patient to reach out for a fixed point at shoulder height so as to elongate the trunk on the weight-bearing side and shorten the trunk on the non-weight-bearing side

Renald 2016 *(Continued)*

- Length of intervention in minutes, days, or weeks: 2 weeks
- Total number of repetitions: 6 sessions/week, 2 weeks, 45 minutes each session
- Total minutes of intervention: 540
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): the exercises were gradually introduced and the number of repetitions was determined on the basis of the patient's performance. The intensity of the exercises was increased by: reducing the base of support, increasing the lever arm, advancing the balance limits, increasing the hold time.
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 2 dropouts (early discharge)
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: Swiss ball
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: patient performed the same set of exercises on a bed. Pelvic bridging: in supine lying, both the patient's legs are placed on the bed and he/she is asked to lift the pelvis off the bed. Unilateral bridging: performed by lifting the uninvolved leg off the bed while maintaining the pelvic bridge position. Trunk rotation: was performed in crook lying position by rotating the pelvis to both sides. Trunk flexion-extension: the patient flexes and extends the trunk without moving the trunk forwards or backwards; Trunk lateral flexion: Upper trunk lateral flexion: the patient touches the exercise table with one elbow and returns to the starting position. Lower trunk lateral flexion: the patient lifts one side of the pelvis and returns to the starting position. Trunk rotations: Upper Trunk: the patient, while sitting in the upright position, moves each shoulder forwards and backwards. Lower trunk: the patient, while sitting in the upright position, moves each knee forwards and backwards. Forward reach: was performed by asking the patient to reach a fixed point at shoulder height by forward flexing the trunk at the hips. Lateral reach: was performed by asking the patient to reach out for a fixed point at shoulder height so as to elongate the trunk on the weight-bearing side and shorten the trunk on the non-weight-bearing side
- Length of intervention in minutes, days, or weeks: 2 weeks
- Total number of repetitions: 6 sessions/week, 2 weeks, 45 minutes each session
- Total minutes of intervention: 540
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): the exercises were gradually introduced and the number of repetitions was determined on the basis of the patient's performance. The intensity of the exercises was increased by: reducing the base of support, increasing the lever arm, advancing the balance limits, increasing the hold time.
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 1 dropout (early discharge)
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: mat
- Reporting of death and serious adverse events, including falls: not reported

Outcomes	Motor assessment scale • Outcome type: continuous outcome

Renald 2016 *(Continued)*

- Direction: higher is better
- Data value: change from baseline

Trunk function

- Outcome type: continuous outcome
- Scale: TIS 1.0
- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Eligible patients were randomly assigned to two groups." Judgement comment: the authors did not describe any details concerning the randomisation process.
Allocation concealment (selection bias)	Unclear risk	Not clear if allocation was concealed. There is insufficient information to make a judgement.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not clear if participants or personnel were blinded during the trial
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "An outcome assessor who was blinded to the group allocation took the outcome measurements using Trunk Impairment scale and Motor assessment scale."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "There were two dropouts in group A and 1 dropout in group B. Finally the study had 8 patients in each group." Judgement comment: dropout rate was rather high (20% and 10%)
Selective reporting (reporting bias)	High risk	Judgement comment: no registration was available and all outcome variables had significant results in favour of the experimental training.
Other bias	Unclear risk	Not clear if any other forms of biases were reduced to permit 'low risk' or 'high risk'

Saeys 2012

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to assess the effect of additional trunk exercises on truncal function. In addition, to investigate whether these truncal exercises result in improved standing balance and mobility
Participants	**Baseline characteristics** Experimental training

Saeys 2012 *(Continued)*

- Mean age and SD: 61.94 ± 13.83
- Number of participants: 18
- Sex (women/men): 9/9
- Type of stroke event (I/H): 15/3
- Location of stroke event (L/R): 7/11
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not described
- Presence of other stroke-related impairments: not described
- Comorbidity at baseline: not described
- Mean time and SD after stroke in days: 38.72 ± 15.09

Control group (same amount of additional therapy)

- Mean age and SD: 61.07 ± 9.01
- Number of participants: 15
- Sex (women/men): 7/8
- Type of stroke event (I/H): 11/4
- Location of stroke event (L/R): 10/5
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not described
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not described
- Presence of other stroke-related impairments: not described
- Comorbidity at baseline: not described
- Mean time and SD after stroke in days: 32.07 ± 25.98

Inclusion criteria: patients included suffered a single, hemispheric lesion.

Exclusion criteria: age 85 years and older, more than 4 months post-onset, acute low back pain, and orthopaedic and neurological disorders that could influence postural control. Furthermore, patients suffering from communication disorders that interfered with the protocol were excluded.

Pretreatment: no differences were found between the 2 groups for the collected demographic variables, stroke-related parameters, and pretreatment outcome measures.

Sample size calculation: The number of patients required for this study was calculated a priori to ensure sufficient statistical power. This revealed that a sample size of 19 patients in each group was necessary to achieve an 80% chance (power = 0.80) of detecting a 10% difference in improvement between the 2 groups on the TIS. Furthermore, 20 patients in each group were required for the Tinetti Test.

Interventions

Intervention characteristics

Experimental training

- Type of intervention: supine position; lifting pelvis in crook lying with both feet supported (bridging); lifting pelvis in crook lying and placing it consequently left and right of midline; lifting shoulder girdle symmetrically and asymmetrically from table in crook lying, rolling to affected and non-affected side initiated from shoulder girdle or pelvis. Sitting position; anterior and posterior tilt of the pelvis; selective lengthening and shortening of one side of the trunk; lateral pelvic tilt without losing balance; rotation of the upper and lower part of the trunk; rotation of the upper trunk with external resistance to both sides, reaching within and out of arm's reach; shuffling forward and backward on hard surface; sitting on unstable platform
- Length of intervention in minutes, days, or weeks: 8 weeks
- Total number of repetitions: 4 sessions/week, 8 weeks, 30 minutes each session
- Total minutes of intervention: 960
- Total minutes of conventional therapy: not reported
- Content of standard care: multidisciplinary conventional physical and occupational therapy as provided by the rehabilitation staff, mainly focused on neurodevelopmental treatments. This treatment concept is a problem-solving approach in which the trunk is an essential component. In clinical practice, activities of the trunk are integrated in postural control and task-directed movement.

Saeys 2012 *(Continued)*

- Who provided study therapy: trained therapists
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): with or without feet support, dual task training, number of repetitions, and the amount of visual feedback
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): patients had to have completed at least 75% of training sessions to be included in the analysis.
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): one patient in the experimental group was discharged after completing 24 of 32 training sessions.
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: passive mobilisation of the upper limb and transcutaneous electrical nerve stimulation of the hemiplegic shoulder while supine
- Length of intervention in minutes, days, or weeks: 8 weeks
- Total number of repetitions: 4 sessions/week, 8 weeks, 30 minutes each session
- Total minutes of intervention: 960
- Total minutes of conventional therapy: not reported
- Content of standard care: multidisciplinary conventional physical and occupational therapy as provided by the rehabilitation staff, mainly focused on neurodevelopmental treatments. This treatment concept is a problem-solving approach in which the trunk is an essential component. In clinical practice, activities of the trunk are integrated in postural control and task-directed movement.
- Who provided study therapy: trained therapists
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): progression was based on the patients' level of performance.
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes

Tinetti balance

- Outcome type: continuous outcome
- Range: 0-16
- Direction: higher is better
- Data value: change from baseline

FAC

- Outcome type: continuous outcome
- Range: 0-5
- Direction: higher is better
- Data value: change from baseline

Rivermead Motor Assessment Battery-gross function

- Outcome type: continuous outcome
- Range: 0-13

Saeys 2012 *(Continued)*

- Direction: higher is better
- Data value: change from baseline

Rivermead Motor Assessment Battery-leg and trunk

- Outcome type: continuous outcome
- Range: 0-10
- Direction: higher is better
- Data value: change from baseline

Trunk function

- Outcome type: continuous outcome
- Scale: Trunk impairment scale 1.0
- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Standing balance

- Outcome type: continuous outcome
- Scale: Berg Balance Scale
- Range: 0-56
- Direction: higher is better
- Data value: change from baseline

Walking ability

- Outcome type: continuous outcome
- Scale: Tinetti gait
- Range: 0-12
- Direction: higher is better
- Data value: change from baseline

Arm-hand activity

- Outcome type: continuous outcome
- Scale: Rivermead Motor Assessment Battery-arm
- Range: 0-15
- Direction: higher is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "For assigning patients to one of both groups, the authors made use of 40 concealed envelopes (20 envelopes for each group), which were randomized by an independent person."
Allocation concealment (selection bias)	Low risk	Quote: "40 concealed envelopes (20 envelopes for each group)"
Blinding of participants and personnel (performance bias)	Unclear risk	Quote: "the therapist for that patient was blinded for the experimental intervention. Progression was based on the patients' level of performance."

Saeys 2012 *(Continued)*

All outcomes		Judgement comment: therapists were blind, however we were not sure if therapy was provided in a separate room.
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "assessor-blinded" Quote: "Clinical evaluations were performed by an independent assessor who was blinded to group assignment and not involved in treatment."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "One patient in the experimental group was discharged after completing 24 of 32 training sessions but was still included in the analysis. In Figure 1, we show the flow diagram for the study."
Selective reporting (reporting bias)	Low risk	Judgement comment: no registration was available. Non-significant and significant results were reported.
Other bias	Low risk	No other potential sources of bias found

Sarwar 2019

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to see the effect of unstable and stable surface exercises for gaining trunk motor performance, functional balance and functional mobility in stroke patients
Participants	**Baseline characteristics** Experimental training • Mean age and SD: not described • Number of participants: 15 • Sex (women/men): not described • Type of stroke event (I/H): not described • Location of stroke event (L/R): not described • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not described • Presence of other stroke-related impairments: not described • Comorbidity at baseline: not described • Mean time and SD after stroke in months: chronic unilateral stroke (6 months) Control group (same amount of additional therapy) • Mean age and SD: not described • Number of participants: 15 • Sex (women/men): not described • Type of stroke event (I/H): not described • Location of stroke event (L/R): not described • Stroke severity at baseline, by means of the NIHSS or comparable scale: not described • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not described • Presence of other stroke-related impairments: not described • Comorbidity at baseline: not described • Mean time and SD after stroke in months: chronic unilateral stroke (6 months)

Sarwar 2019 *(Continued)*

Inclusion criteria: chronic unilateral stroke (6 months), more than 30 seconds standing ability without any support, a score of 24 or over on a MMSE, ability to sit independently for at least 30 seconds on a stable surface without any assistance

Exclusion criteria: other conditions affecting balance such as cerebellar diseases, vestibular pathology, muscle and skeletal system disorders such as arthritis or backache, any degenerated condition affecting lower limb performance

Pretreatment: both groups were found similar for gender, socioeconomic status, occupation, type of stroke, status of diabetes and hypertension at baseline.

Sample size calculation: not calculated

Interventions	**Intervention characteristics** Experimental training • Type of intervention: trunk exercise with unstable surface. • Length of intervention in minutes, days, or weeks: not described • Total number of repetitions: not described • Total minutes of intervention: not described • Total minutes of conventional therapy: not described • Content of standard care: not described • Who provided study therapy: not described • How provided (face-to-face, internet, telephone, individual, in group): not described • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not described • Modification (intervention was modified during the course of the study?): not described • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not described • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not described • Material used: not described • Reporting of death and serious adverse events, including falls: not reported Control group (same amount of additional therapy) • Type of intervention: trunk exercises with stable surface • Length of intervention in minutes, days, or weeks: not described • Total number of repetitions: not described • Total minutes of intervention: not described • Total minutes of conventional therapy: not described • Content of standard care: not described • Who provided study therapy: not described • How provided (face-to-face, internet, telephone, individual, in group): not described • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not described • Modification (intervention was modified during the course of the study?): not described • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not described • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not described • Material used: not described • Reporting of death and serious adverse events, including falls: not reported
Outcomes	Trunk function

Sarwar 2019 *(Continued)*

- Outcome type: continuous outcome
- Scale: TIS 1.0
- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Standing balance

- Outcome type: continuous outcome
- Scale: Berg Balance Scale
- Range: 0-56
- Direction: higher is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Judgement comment: they were randomly allocated to the control and experimental groups.
Allocation concealment (selection bias)	Unclear risk	Not clear if allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not clear if participants and personnel were blinded
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Blinding of assessor was not described.
Incomplete outcome data (attrition bias) All outcomes	Low risk	Judgement comment: there were no patient dropouts during the study.
Selective reporting (reporting bias)	High risk	Judgement comment: no study registration. Only significant outcomes were reported.
Other bias	Unclear risk	Not described if there were any forms of concealment

Seo 2012

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to investigate the effect of trunk stabilisation exercises on the thickness of deep abdominal muscles and the effectiveness of this change in the thickness of the deep abdominal muscles on balance
Participants	**Baseline characteristics** Experimental training

Seo 2012 *(Continued)*

- Mean age and standard deviation: 59.8 ± 12.8
- Number of participants: 6
- Sex (women/men): 1/5
- Type of stroke event (I/H): 3/3
- Location of stroke event (L/R): 3/3
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 7.33 ± 4.63

Control group (no additional therapy)

- Mean age and standard deviation: 57.83 ± 10.7
- Number of participants: 6
- Sex (women/men): 1/5
- Type of stroke event (I/H): 3/3
- Location of stroke event (L/R): 1/5
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 16.50 ± 15.44

Inclusion criteria: agreement to participate in the study, within 6 months from the onset of stroke, no complaints of chronic back pain or current back pain, and the ability to follow directions given by therapists (MMSE-K over 24 points)

Exclusion criteria: not reported

Pretreatment: there were no significant differences in the age, height, weight, days since stroke onset, and MMSE-K between the experimental and control groups (P > 0.05).

Sample size calculation: not mentioned

Interventions

Intervention characteristics

Experimental training

- Type of intervention: trunk stabilisation exercises using sonographic visual feedback for 30 minutes. Abdominal hollowing exercises, trunk side flexion, and resisted trunk rotation methods using real-time ultrasound feedback; this was done 5 times in the week. These 3 exercises were conducted without real-time ultrasound feedback during the second to fifth week for 4 weeks.
- Length of intervention in minutes, days, or weeks: 5 weeks
- Total number of repetitions: 5 sessions/week, 5 weeks, 30 minutes
- Total minutes of intervention: 750
- Total minutes of conventional therapy: not reported
- Content of standard care: conservative physiotherapy consisted of posture control training, walking training, and muscle strength exercises, and was conducted to maximise activities of daily living and to develop function.
- Who provided study therapy: researchers
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): three dropouts in the experimental group

Seo 2012 *(Continued)*

- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): three dropouts
- Material used: sonographic M-mode
- Reporting of death and serious adverse events, including falls: not reported

Control group (no additional therapy)

- Type of intervention: not reported
- Length of intervention in minutes, days, or weeks: not reported
- Total number of repetitions: not reported
- Total minutes of intervention: not reported
- Total minutes of conventional therapy: not reported
- Content of standard care: conservative physiotherapy consisted of posture control training, walking training, and muscle strength exercises, and was conducted to maximise activities of daily living and to develop function.
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): two patients in the control group
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): two dropouts
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes

Standing balance

- Outcome type: continuous outcome
- Scale: Functional Reach Test (cm) in standing
- Data value: change from baseline

Trunk function

- Outcome type: continuous outcome
- Scale: Postural Assessment Scale for Stroke
- Direction: higher is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Subjects were randomly assigned to the experimental group (EG) and the control group (CG) in this study."
Allocation concealment (selection bias)	Unclear risk	Quote: "Subjects were randomly assigned to the experimental group (EG) and the control group (CG) in this study. " There is insufficient info here to make a judgement.
Blinding of participants and personnel (performance bias)	Unclear risk	No description available in this trial

Seo 2012 *(Continued)*
All outcomes

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No description available in this trial
Incomplete outcome data (attrition bias) All outcomes	High risk	Quote: "Three patients in the experimental group and 1 patient in the control group did not complete the study, and 1 patient in the control group also failed to fully participate after sustaining an above-knee fracture during the study period." Judgement comment: not all details for the reasons for dropout were given.
Selective reporting (reporting bias)	Low risk	No registration available, no P values reported; both significant and not-significant results were reported.
Other bias	Unclear risk	Not described by the study authors

Shah 2016

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to test the effect of truncal motor imagery practice on trunk performance, functional balance, and daily activities in acute stroke patients. It was hypothesised that the motor imagery practice in addition to conventional therapy will have better trunk performance, functional balance, and daily activities over the conventional therapy in acute stroke patients.
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 59.8 ± 9.58 • Number of participants: 10 • Sex (women/men): 4/6 • Type of stroke event (I/H): 7/3 • Location of stroke event (L/R): 6/4 • Stroke severity at baseline, by BI: 2 ± 3.49 • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in days: 4.8 ± 2.53 Control group (same amount of additional therapy) • Mean age and SD: 55.5 ± 8.79 • Number of participants: 12 • Sex (women/men): 4/8 • Type of stroke event (I/H): 9/3 • Location of stroke event (L/R): 8/4 • Stroke severity at baseline, by BI: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported

Shah 2016 *(Continued)*

- Mean time and SD after stroke in days: 3.92 ± 3.29

Inclusion criteria: acute stroke patients with haemodynamic stability, aged between 30 and 70 years, 1st time stroke with unilateral supratentorial lesion, and capable of following simple verbal commands

Exclusion criteria: TIS score > 20 at baseline, history of multiple stroke, and other neurological diseases (Parkinson's disease, vestibular disturbances) or musculoskeletal problems (low back pain, arthritis) affecting the balance

Pretreatment: the baseline variables were comparable `between-groups`.

Sample size calculation: not calculated

Interventions	**Intervention characteristics** Experimental training • Type of intervention: the patients were instructed to view a 15-min trunk exercises video on an audiovisual display terminal (motor imagery video). They were given 45 min of trunk exercises during the first session and 30 min of conventional therapy during the second session. The imagery video showing the task-specific trunk exercises had a total of 11 exercises similar to those which patients had to perform during the physical practice sessions. It had basic exercises such as bridging and upper-lower trunk rotations in supine progressing to unilateral bridging with single arm or leg raises and upper and lower trunk flexion with rotation, respectively. Exercises in sitting were forward reach-outs, lateral trunk flexion, and pelvic lifts, which were progressed to forward reach-outs in multiple directions, increasing the lateral flexion arc of movement and pelvic shuffling, respectively. All the exercises shown were looped to repeat for six to seven times. While projecting the video on the laptop screen, it was ensured that the patients were in a comfortable position and the screen was in the patient's visual field. They were commonly positioned in semi-reclined sitting or high sitting with feet supported. Adequate rest periods were given between and after the video sessions, as required. Patients were asked to perform exercises similar to those shown in the motor imagery video. Repetition of the exercises was based on their ability which could be a minimum of five repetitions per session to a maximum of 10 repetitions per exercise session. • Length of intervention in minutes, days, or weeks: 3 weeks • Total number of repetitions: 6 sessions/week, 3 weeks, 90 minutes/day (2 sessions/day) • Total minutes of intervention: 1620 • Total minutes of conventional therapy: not reported • Content of standard care: basic physiotherapy techniques such as range of motion exercises, facilitation techniques, bridging, and weight-bearing strategies • Who provided study therapy: qualified physical therapist pursuing master's in neurological physiotherapy • How provided (face-to-face, internet, telephone, individual, in group): face-to-face • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): exercises were shown based on the patient's ability to perform or replicate the same and the progression was determined based on the performance in the practice sessions. • Modification (intervention was modified during the course of the study?): not reported • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported • Material used: audiovisual display terminal • Reporting of death and serious adverse events, including falls: not reported Control group (same amount of additional therapy) • Type of intervention: conventional therapy, advice to the patient on how to improve the performance of the previous session, conventional exercises in the second session of the day • Length of intervention in minutes, days, or weeks: 3 weeks • Total number of repetitions: 6 sessions/week, 3 weeks, 90 minutes/session (2 sessions/day)

Shah 2016 *(Continued)*

- Total minutes of intervention: 1620
- Total minutes of conventional therapy: not reported
- Content of standard care: conventional acute stroke rehabilitation protocol recommended by the neurological physiotherapy unit. The protocol constituted basic physiotherapy techniques such as range of motion exercises, facilitation techniques, bridging, and weight-bearing strategies.
- Who provided study therapy: qualified physical therapist pursuing master's in neurological physiotherapy
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes

Trunk Control Test

- Outcome type: continuous outcome
- Scale: Trunk Control Test
- Range: 0-100
- Direction: higher is better
- Data value: change from baseline

Brunel Balance Assessment-standing

- Outcome type: continuous outcome
- Scale: Brunel Balance Assessment-standing
- Range: 0-3
- Direction: higher is better
- Data value: change from baseline

Brunel Balance Assessment-stepping

- Outcome type: continuous outcome
- Scale: Brunel Balance Assessment-stepping
- Range: 0-6
- Direction: higher is better
- Data value: change from baseline

Trunk function

- Outcome type: continuous outcome
- Scale: TIS 1.0
- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Activities of daily living

- Outcome type: continuous outcome
- Scale: Barthel Index
- Range: 0-100
- Direction: higher is better
- Data value: change from baseline

Shah 2016 *(Continued)*

	Standing balance • Outcome type: continuous outcome • Scale: Brunel Balance Assessment • Range: 0-12 • Direction: higher is better • Data value: change from baseline
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Block randomization method was used to allocate the patients into two groups." Judgement comment: was not described in enough detail so that readers could reproduce the randomisation, e.g. no information was available about the size of the blocks
Allocation concealment (selection bias)	Low risk	Quote: "Concealed allocation was followed throughout the study, and the observer who performed the randomization was not involved in either conducting the interventions or collecting the outcome measures."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not described by the study authors
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Assessor blinding was done, and the assessor was not a part of the intervention."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Judgement comment: 1 dropout in the experimental group due to early discharge
Selective reporting (reporting bias)	Low risk	Judgement comment: no registration; non-significant outcomes were presented in the manuscript and P values were included.
Other bias	Low risk	No other potential sources of bias found

Sharma 2017

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to show that addition of core stabilisation programme to pelvic PNF would help in improving core stability in order to attain trunk control and controlled mobility for improving balance, gait and functional ability in stroke patients
Participants	**Baseline characteristics** Experimental training

Sharma 2017 *(Continued)*

- Mean age and SD: 57.23 ± 7.39
- Number of participants: 13
- Sex (women/men): 2/11
- Type of stroke event (I/H): not described
- Location of stroke event (L/R): 8/5
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not described
- Presence of other stroke-related impairments: not described
- Comorbidity at baseline: not described
- Mean time and SD after stroke in months: 12.15 ± 3.89

Control group (same amount of additional therapy)

- Mean age and SD: 57 ± 8.26
- Number of participants: 10
- Sex (women/men): 1/9
- Type of stroke event (I/H): not described
- Location of stroke event (L/R): 6/4
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not described
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not described
- Presence of other stroke-related impairments: not described
- Comorbidity at baseline: not described
- Mean time and SD after stroke in months: 13.30 ± 4.27

Inclusion criteria: participants were recruited from the Rehabilitation Department of Indian Spinal Injuries Hospital, Vasant Kunj and Physiotherapy Department, Vidyasagar Institute of Mental Health, Neurology and Allied Sciences, Delhi. Participants with first ever unilateral ischaemic stroke involving middle cerebral artery territory; duration of stroke more than 6 months; age between 45–60 years were included. Participants should be able to walk with or without support for 10 m. Participants should be able to understand and follow simple verbal instructions (MMSE ≥ 24).

Exclusion criteria: participants with recurrent stroke; brainstem or cerebellar stroke or haemorrhagic stroke were excluded. Also, participants with severe spasticity (Modified Ashworth Scale grade ≥ 3) or severe flaccidity in lower limbs and upper limbs were excluded.

Pretreatment: no significant differences at baseline

Sample size calculation: sample size was determined through power calculation based on previous studies for core stabilisation in stroke patients with an estimated effect size of 0.80, an overall sample of 16 participants (8 in each group) at the 0.05 level of significance. However, 26 participants were recruited to allow 10% dropout.

Interventions

Intervention characteristics

Experimental training

- Type of intervention: core stabilisation + pelvic PNF: Participants in group 1 were positioned in supine. They were asked to recognise their neutral spine position that is midrange between flexion and extension. The core muscles trained were transverse abdominis, multifidus, paraspinals, quadratus lumbo-rum, and obliques. In the first stage, the participants were taught to activate abdominal wall musculature. They were initially trained to perform abdominal bracing. In order to ensure that the participants were contracting the right musculature, a pressure biofeedback device was used. The lower end of an inflatable bag was placed at the posterior superior iliac spine. Before starting the contraction, the bag was inflated to a pressure of 40 mmHg with the valve closed and participants were instructed to breathe deeply using mainly abdominal wall musculature, then the inflatable bag was adjusted to 40 mmHg again. Participants were requested to perform abdominal muscle contractions with the following verbal commands standardised by the examiner: “Tighten your abdomen in order to make it like a rigid cylinder without moving your ribs and pelvis”. Since the contraction of transverse abdominis results in an increase in pressure ranging from 4–10 mmHg, hence a pressure rise of at least 4

Sharma 2017 *(Continued)*

mmHg was considered as positive reinforcement for correct movement. Once the patient mastered the technique of abdominal bracing, progression was made to other core-stability exercises. Participants were then positioned in quadruped position and asked to lift alternate arms, gradually progressing to alternate leg lifts and alternate arm/leg raises to activate multifidus. This was followed by side bridges (side plank) exercise for activation of quadratus lumborum and obliques. The participants were then asked to perform trunk curls in crook lying, asked to lift their upper trunk slightly (15°) from the plinth, hold the position for 5 sec. The progression of exercises was done once the patient was able to perform 30 repetitions of each exercise with 8-sec hold. The participants were told to maintain normal diaphragmatic breathing throughout the intervention. Patterns of movement performed were anterior elevation-posterior depression of the hemiplegic side. Participants' were positioned in side lying on the unaffected side, with both hips flexed to 100° and the knees flexed to 45°. Their neck was supported by a pillow and flexed to 30°. The therapist stood behind the participants facing the direction of pelvic movement of the subject. The therapist's hands were placed on the anterior iliac spine of the subject's pelvis for anterior elevation or on the subject's ischial tuberosity for posterior depression. Stretch was applied immediately and gently after the target muscles had been fully lengthened but before the participant started to move. Resistance was applied variably to obtain a smooth and co-ordinated movement. Assistance was provided if required by the participants. Specific and timed commands were given to obtain the desired movement. "Pull up" was used to facilitate pelvic anterior elevation, and "push down" and "sit into my hands" were used to facilitate pelvic posterior depression. The elements of PNF such as positioning, manual contact, resistance and verbal commands were incorporated into the treatment. Techniques used in this study were rhythmic initiation, slow reversal, and agonistic reversals. The sequence was rhythmic initiation first for 10 min, then slow reversal for 10 mins, and then agonistic reversals for an additional 10 mins with 2 mins of rest between each technique. A stopwatch was used to measure the time.

- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 5 sessions/week, 4 weeks, 60 minutes each session
- Total minutes of intervention: 1200
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face, hands-on
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): the progression of exercises was done once the patient was able to perform 30 repetitions of each exercise with an 8-sec hold.
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 2 dropouts: due to health problems unrelated with training
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: pressure biofeedback device
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: pelvic PNF along with trunk flexibility exercises, which consisted of task-specific exercises of the upper and lower part of the trunk. The exercises were performed both in the supine and in sitting positions. They were performed for a total of 30 mins including 6 mins of rest period in between as per the patients requirement, once in a day, 5 days per week for 4 weeks. Patterns of movement performed were anterior elevation-posterior depression of the hemiplegic side. Participants were positioned in side lying on the unaffected side, with both hips flexed to 100°and the knees flexed to 45°. Their necks were supported by a pillow and flexed to 30°. The therapist stood behind the participants facing the direction of pelvic movement of the participant. The therapist's hands were placed on the anterior iliac spine of the participant's pelvis for anterior elevation or on the participant's ischial tuberosity for posterior depression. Stretch was applied immediately and gently after the target muscles had been fully lengthened but before the participant started to move. Resistance was applied variably to obtain a smooth and co-ordinated movement. Assistance was provided if required by the participants. Specific and timed commands were given to obtain the desired movement. "Pull up" was used to facilitate pelvic anterior elevation, and "push down" and "sit into my hands"

Sharma 2017 *(Continued)*

were used to facilitate pelvic posterior depression. The elements of PNF such as positioning, manual contact, resistance and verbal commands were incorporated into the treatment. Techniques used in this study were rhythmic initiation, slow reversal, and agonistic reversals. The sequence was rhythmic initiation first for 10 mins, then slow reversal for 10 mins, and then agonistic reversals for an additional 10 mins with 2 mins of rest between each technique. A stopwatch was used to measure the time.

- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 5 sessions/week, 4 weeks, 60 minutes each session
- Total minutes of intervention: 1200
- Total minutes of conventional therapy: not reported
- Content of standard care: not reported
- Who provided study therapy: therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face, hands-on
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: 1 dropout: due to change in residence/hospital
- Reporting of death and serious adverse events, including falls: not reported

Outcomes

Trunk function

- Outcome type: continuous outcome
- Scale: TIS 1.0
- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Activities of daily living

- Outcome type: continuous outcome
- Scale: modified Barthel Index
- Range: 0-20
- Direction: higher is better
- Data value: change from baseline

Walking ability

- Outcome type: continuous outcome
- Scale: Wisconsin Gait Scale
- Direction: lower is better
- Data value: change from baseline

Standing balance

- Outcome type: continuous outcome
- Scale: Tinetti-POMA (balance and gait)
- Range: 0-28
- Direction: higher is better
- Data value: change from baseline

Mini-BESTest

- Outcome type: continuous outcome
- Scale: Mini-BESTest

Sharma 2017 *(Continued)*

- Range: 0-28
- Direction: higher is better
- Data value: change from baseline

Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "For random allocation a computer generated random allocation schedule was created by a person other than the principal investigator." Quote: "For random allocation a computer generated random allocation schedule"
Allocation concealment (selection bias)	Low risk	Quote: "was created by a person other than the principal investigator. To ensure concealment the allocation schedule was sequentially numbered and sealed in opaque envelopes. Person not associated with the study opened the numbered envelopes sequentially to reveal the participant's group allocation."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not described by the study authors
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "assessor-blinded randomised"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "Dropouts: due to health problems unrelated with training" Judgement comment: 2 and 1 dropouts; the reasons were described in the manuscript.
Selective reporting (reporting bias)	Low risk	Judgement comment: no study registration; significant and non-significant results were reported.
Other bias	Low risk	No other potential sources of bias found

Sheehy 2020

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** the primary research objective was to determine whether supplemental sitting balance exercises, administered via VRT, improved the control of sitting balance in stroke rehabilitation inpatients. The secondary objective was to determine whether this programme of sitting balance exercises improved the performance of upper extremity functional tasks, some of which integrate sitting balance.
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 64.9 ± 15.8

Sheehy 2020 *(Continued)*

- Number of participants: 33
- Sex (women/men): 11/22
- Type of stroke event (I/H): 21/12
- Location of stroke event (L/R/Bilateral): 14/18/1
- Stroke severity at baseline, by FIM: 57.4 ± 11.4
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not described
- Presence of other stroke-related impairments: not described
- Comorbidity at baseline: not described
- Mean time and SD after stroke in months: 43.5 ± 28.9

Control group (same amount of additional therapy)

- Mean age and SD: 64.7 ± 16..2
- Number of participants: 36
- Sex (women/men): 16/20
- Type of stroke event (I/H): 25/11
- Location of stroke event (L/R/Bilateral): 13/23/0
- Stroke severity at baseline, by FIM: 57.0 ± 9.5
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not described
- Presence of other stroke-related impairments: not described
- Comorbidity at baseline: not described
- Mean time and SD after stroke in months: 40.7 ± 25.5

Inclusion criteria: 1) had a stroke in the previous 6 months (ischaemic or haemorrhagic, all brain regions) and were attending inpatient rehabilitation, (2) could sit independently for at least 1 minute without support and at least 20 minutes with support, (3) were not able to stand independently for more than 1 minute, and (4) could provide informed consent

Exclusion criteria: (1) had a medical condition that precluded exercise of mild to moderate intensity, (2) had vestibular deficits or vertigo, or (3) had seizure activity in the prior 6 months

Pretreatment: there were no significant differences between groups with respect to demographic characteristics or amount of training received.

Sample size calculation: sample size was estimated using MedCalc software (version12, MedCalc Software, Ostend, Belgium), based on the primary outcome measure, the Function in Sitting Test (FIST), and the formula for the difference between two independent means (two-tailed, $\alpha = 0.05$, $(1-\beta) = 0.80$, minimal clinically important difference 6.5 points, SD 9 points). The sample size was thus 31 participants per group; 38 per group allowing for a 20% dropout rate.

Interventions	**Intervention characteristics** Experimental training • Type of intervention: six Jintronix games (designed for stroke recovery) that required trunk lean and reaching beyond arms' length, for example using trunk movements to move a virtual ball along a horizontal track, weaving a virtual motorcycle around a series of barriers, or reaching to touch balls located beyond arms' length. Game parameters were adjusted to keep the participants engaged while working towards their group goals. The time spent doing games (not including setup or rests) as well as the number of completed repetitions of each movement were recorded and used to estimate rehabilitation intensity. To encourage as much trunk use as possible while doing sitting balance exercises, participants in the experimental group sat in a wheelchair with a firm, flat cushion, with the armrests and seat belt removed, and were instructed to avoid touching the seat back, if possible. The excursion of the centre of pressure (CoP) was used as a proxy for trunk movement and provided data to the VRT trainer to ensure that participants in the experimental group moved their trunk and those in the control group minimised trunk movement. CoP was monitored with a CONFORMat pressure mat (Tekscan, South Boston, MA), placed on top of the wheelchair cushion on three VRT sessions (first, fifth, last). Three minutes of CoP data, taken at 30 Hz, were acquired for each game performed at these sessions. • Length of intervention in minutes, days, or weeks: 4 weeks

Sheehy 2020 *(Continued)*

- Total number of repetitions: 10 sessions, 30 minutes/session
- Total minutes of intervention: 300
- Total minutes of conventional therapy: not described
- Content of standard care: conventional stroke inpatient rehabilitation programme, consisting of nursing care and 2-3 sessions a day of physiotherapy, occupational therapy, rehabilitative exercise, and speech-language pathology
- Who provided study therapy: experienced physiotherapist (during vacation coverage, VRT was administered by a PhD candidate/kinesiologist, with 4 years of VRT experience)
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not described
- Modification (intervention was modified during the course of the study?): game parameters were adjusted to keep the participants engaged while working towards their group goals.
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 2 dropouts (did not like study: 1; discharge early: 1)
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not described
- Material used: Jintronix software (Jintronix, Montreal, Quebec, Canada) and a Kinect 2 three-dimensional motion-tracking camera (Microsoft Canada Co., Mississauga, Ontario, Canada)
- Reporting of death and serious adverse events, including falls: there were no serious adverse effects. Two participants experienced shoulder pain on their hemiplegic side and were removed from the study by mutual decision; however, the pain was not primarily attributable to VRT.

Control group (same amount of additional therapy)

- Type of intervention: participants in the control group played five games that required limited arm movement and minimal trunk movement, for example reaching within arms' length to virtually pick up cutlery from a table and put it in a drawer, using small arm movements to move a virtual fish along a vertical track. Game parameters were adjusted to keep the participants engaged while working towards their group goals. The time spent doing games (not including setup or rests) as well as the number of completed repetitions of each movement were recorded and used to estimate rehabilitation intensity. To minimise trunk movement, participants in the control group sat in a wheelchair with a softer, contoured cushion, with armrests and seat belt in place and diagonal straps positioned snuggly across the chest.
- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 10 sessions, 30 minutes/session
- Total minutes of intervention: 300
- Total minutes of conventional therapy: not described
- Content of standard care: conventional stroke inpatient rehabilitation programme, consisting of nursing care and 2-3 sessions a day of physiotherapy, occupational therapy, rehabilitative exercise, and speech-language pathology
- Who provided study therapy: experienced physiotherapist (during vacation coverage, VRT was administered by a PhD candidate/kinesiologist, with 4 years of VRT experience)
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not described
- Modification (intervention was modified during the course of the study?): not described
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 5 dropouts (did not like study: 1; discharge early 1; returned to acute care: 1; shoulder pain: 2)
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not described
- Material used: Jintronix software (Jintronix, Montreal, Quebec, Canada) and a Kinect 2 three-dimensional motion-tracking camera (Microsoft Canada Co., Mississauga, Ontario, Canada)

Sheehy 2020 *(Continued)*

- Reporting of death and serious adverse events, including falls: two participants experienced shoulder pain on their hemiplegic side and were removed from the study by mutual decision; however, the pain was not primarily attributable to VRT.

Outcomes

Ottawa Sitting Scale

- Outcome type: continuous outcome
- Scale: Ottawa Sitting Scale
- Range: 0-40
- Direction: higher is better
- Data value: change from baseline

Reaching Performance Scale for stroke

- Outcome type: continuous outcome
- Scale: Reaching Performance Scale for stroke
- Range: 0-18
- Direction: higher is better
- Data value: change from baseline

Arm-hand function

- Outcome type: continuous outcome
- Scale: Wolf Motor Function Test
- Range: 0-75
- Direction: higher is better
- Data value: change from baseline

Trunk function

- Outcome type: continuous outcome
- Scale: Function in Sitting Test
- Range: 0-56
- Direction: higher is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Participants were randomized within permuted blocks in a 1:1 ratio using a web-based randomization system based at a remote coordinating center (Ottawa Methods Centre, Ottawa Hospital Research Institute, Ottawa, Canada)."
Allocation concealment (selection bias)	Low risk	Quote: "The assessor (A.T.-H.) entered each participant's code into the randomization system and an email was sent with the allocation to the VRT trainer (L.S.). L.S. informed the participants of their allocation at the first VRT session."
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "L.S. informed the participants of their allocation at the first VRT session."

Sheehy 2020 *(Continued)*

Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "A.T.-H. was blinded to the participant's group allocation and L.S. was blinded to the outcome measures."
Incomplete outcome data (attrition bias) All outcomes	High risk	Judgement comment: there was a higher rate of dropouts in the control group (13%). All details were described.
Selective reporting (reporting bias)	High risk	Judgement comment: trial registration was available. Some data were not reported such as limits of stability in sitting and nothing was reported concerning feedback of the training.
Other bias	Unclear risk	Not clearly described if there were any other forms of biases

Shim 2020

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to investigate the effect of electromyography (EMG)-induced functional electrical stimulation during proprioceptive neuromuscular stimulation trunk pattern on trunk control, balance and gait ability
Participants	**Baseline characteristics** Experimental training (trunk training) • Mean age and SD: 59.65 ± 16.52 • Number of participants: 17 • Sex (women/men): 7/10 • Type of stroke event (I/H): 11/6 • Location of stroke event (L/R): 8/9 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not described • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not described • Presence of other stroke-related impairments: not described • Comorbidity at baseline: not described • Mean time and SD after stroke in months: 11.59 ± 5.90 Control group • Mean age and SD: 56.00 ± 15.61 • Number of participants: 16 • Sex (women/men): 7/9 • Type of stroke event (I/H): 9/7 • Location of stroke event (L/R): 8/8 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not described • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not described • Presence of other stroke-related impairments: not described • Comorbidity at baseline: not described • Mean time and SD after stroke in months: 13.88 ± 5.51 **Inclusion:** those diagnosed with stroke for the first time, those who were between 6 months and 24 months after stroke, those who were able to walk 10 m regardless of usage of walking aids, those who scored ≥ 24 points in the MMSE-K and thus could understand simple verbal instructions of the thera-

Shim 2020 *(Continued)*

pist, those who had no orthopaedic problems such as fractures, cuts, etc, and those who had not participated in similar experiments within the last 12 months

Exclusion criteria: those whose time since stroke was < 6 months, those who had visuospatial or auditory problems, those who had a neurological condition that might affect balance and gait other than stroke, those who suffered recurrent stroke, and those who had an electrical stimulation contraindication

Pretreatment: no differences between general and clinical baseline characteristics

Sample size calculation: no sample size calculation was conducted.

Interventions	**Intervention characteristics** Experimental training (trunk training) • Type of intervention: PNF + EMG-triggered FES. The trunk flexion and trunk extension patterns are done for trunk control in the sitting position, at this time, to induce direct movement of the trunk, manual contact is made at the anterior scapula during trunk flexion, and manual contact is made during trunk extension. The bilateral lower extremity flexion pattern and bilateral lower extremity extension pattern require moving both legs as one unit to induce trunk movement. This pattern is also used in combination with flexion of the hip joint and flexion of the knee joint, and with extension of the hip joint. In this study, bilateral lower trunk flexion was called lower trunk flexion pattern, and bilateral lower trunk extension pattern was called lower trunk extension pattern. During therapeutic interventions, patients were in the sitting position when performing the trunk pattern and in the supine position when performing the lower trunk pattern. The "trunk flexion pattern" involving the scapula consists of trunk flexion, lateral flexion, and ipsilateral rotation, and the "trunk extension pattern" consists of trunk extension, lateral flexion, and ipsilateral rotation. The "lower trunk extension pattern" involving the lower extremities consists of trunk extension, lateral flexion, and ipsilateral rotation. When applying the trunk pattern, the therapist checked the flexion pattern by confirming the contractions of the abdominis rectus, external oblique, and internal oblique, and the extension pattern by confirming the contraction of the latissimus dorsi and trapezius middle fibber. In application of the therapeutic intervention, optimal resistance is applied with the intensity that the patient is also able to overcome, which does not interfere with performing the pattern. In addition, a replication technique was used to show the end position of the trunk pattern; after the desired muscle contraction was induced with training of the end position, the combination of isotonic technique from the start position to the end position was used to strengthen the muscle. All therapeutic interventions induced muscle contraction on the affected side that had weakened muscle strength. In this study, only the outer oblique muscle was stimulated, the trunk flexion pattern was performed; the latissimus dorsi muscle was stimulated and the trunk extension pattern was performed. The electrical stimulation was a symmetrical rectangular biphasic, constant current with a frequency of 35 Hz and a pulse width of 200 μ, and it consisted of a 1.5 rise time, a 5 s stimulation time, and a 1.5 fall time. A 3 s pause between contractions was also given to minimise muscle fatigue. The electrical stimulation intensity was 10 to 20 mA. If the participant failed to reach the target threshold, electrical stimulation was automatically initiated after 20 s. Target thresholds for electrical stimulation were measured at each treatment session and reflected in threshold sessions. • Length of intervention in minutes, days, or weeks: 4 weeks • Total number of repetitions: 5 sessions/week, 4 week, 30 minutes/session • Total minutes of intervention: 600 • Total minutes of conventional therapy: not described • Content of standard care: not described • Who provided study therapy: therapist • How provided (face-to-face, internet, telephone, individual, in group): face-to-face • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not described • Modification (intervention was modified during the course of the study?): if the participant failed to reach the target threshold, electrical stimulation was automatically initiated after 20 s. Target thresholds for electrical stimulation were measured at each treatment session and reflected in threshold sessions.

Shim 2020 *(Continued)*

- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 3 excluded from analysis
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: EMG-triggered FES (walking man II EMG FES 2000 model, Cybermedic Inc., Iksan, Korea)
- Reporting of death and serious adverse events, including falls: not reported

Control group

- Type of intervention: PNF. The trunk flexion and trunk extension patterns are done for trunk control in the sitting position, at this time, to induce direct movement of the trunk, manual contact is made at the anterior scapula during trunk flexion, and manual contact is made during trunk extension. The bilateral lower extremity flexion pattern and bilateral lower extremity extension pattern require moving both legs as one unit to induce trunk movement. This pattern is also used in combination with flexion of the hip joint and flexion of the knee joint, and with extension of the hip joint. In this study, bilateral lower trunk flexion was called lower trunk flexion pattern, and bilateral lower trunk extension pattern was called lower trunk extension pattern. During therapeutic interventions, patients were in the sitting position when performing the trunk pattern and in the supine position when performing the lower trunk pattern. The "trunk flexion pattern" involving the scapula consists of trunk flexion, lateral flexion, and ipsilateral rotation, and the "trunk extension pattern" consists of trunk extension, lateral flexion, and ipsilateral rotation. The "lower trunk extension pattern" involving the lower extremities consists of trunk extension, lateral flexion, and ipsilateral rotation. When applying the trunk pattern, the therapist checked the flexion pattern by confirming the contractions of the abdominis rectus, external oblique, and internal oblique, and the extension pattern by confirming the contraction of the latissimus dorsi and trapezius middle fibber. In application of the therapeutic intervention, optimal resistance is applied with the intensity that the patient is also able to overcome, which does not interfere with performing the pattern. In addition, a replication technique was used to show the end position of the trunk pattern; after the desired muscle contraction was induced with training of the end position, the combination of isotonic technique from the start position to the end position was used to strengthen the muscle. All therapeutic interventions induced muscle contraction on the affected side that had weakened muscle strength.
- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 5 sessions/week, 4 week, 30 minutes/session
- Total minutes of intervention: 600
- Total minutes of conventional therapy: not described
- Content of standard care: not described
- Who provided study therapy: therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not described
- Modification (intervention was modified during the course of the study?): not described
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 4 excluded from analysis
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not described
- Material used: not described
- Reporting of death and serious adverse events, including falls: not reported

Outcomes

Trunk function

- Outcome type: continuous outcome
- Scale: TIS 1.0
- Range: 0-23
- Direction: higher is better
- Data value: endpoint

Walking ability

Shim 2020 *(Continued)*

- Outcome type: continuous outcome
- Scale: Dynamic Gait Index
- Range: 0-24
- Direction: higher is better
- Data value: endpoint

Standing balance

- Outcome type: continuous outcome
- Scale: Berg Balance Scale
- Range: 0-56
- Direction: higher is better
- Data value: endpoint

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Judgement comment: the random assignment method was applied to the experimental and control group using random (rand) function after the participants were coded and entered into an Excel file.
Allocation concealment (selection bias)	Unclear risk	Judgement comment: the random assignment method was applied to the experimental and control group using random (rand) function after the participants were coded and entered into an Excel file.
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: the participants did not know the nature of the group to which they belonged until the end of the study. Therapists were not blinded.
Blinding of outcome assessment (detection bias) All outcomes	High risk	Judgement comment: single blinding, the participants did not know the nature of the group to which they belonged until the end of the study. Participants were blinded, not the assessor.
Incomplete outcome data (attrition bias) All outcomes	High risk	Judgement comment: 3 participants in the experimental group and 4 in the control group were not analysed. The study authors did not provided any further information.
Selective reporting (reporting bias)	High risk	Judgement comment: 4 participants in the experimental group and 3 in the control group were not analysed. Possible selective outcome reporting
Other bias	Unclear risk	Not clear if any other forms of biases were reduced to permit 'low risk' or 'high risk'

Shin 2016

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to investigate the effect of trunk stabilisation exercises on the thickness of deep abdominal muscles and the effectiveness of this change in the thickness of the deep abdominal muscles on balance

Shin 2016 *(Continued)*

Participants	**Baseline characteristics** Experimental training • Mean age and standard deviation: 57.75 ± 14.03 • Number of participants: 12 • Sex (women/men): not reported • Type of stroke event (I/H): 3/9 • Location of stroke event (L/R): 7/5 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not described • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not described • Presence of other stroke-related impairments: not described • Comorbidity at baseline: not described • Mean time and SD after stroke in months: 17.58 ± 10.04 Control group (no additional therapy) • Mean age and standard deviation: 59.25 ± 9.75 • Number of participants: 12 • Sex (women/men): not reported • Type of stroke event (I/H): 2/10 • Location of stroke event (L/R): 4/8 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not described • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not described • Presence of other stroke-related impairments: not described • Comorbidity at baseline: not described • Mean time and SD after stroke in months: 15.17 ± 7.13 **Inclusion criteria:** chronic hemiplegia for more than 6 months resulting from a single stroke; the ability to sit independently for at least 30 minutes; the ability to walk with or without the use of an assistive device for 10 minutes; the ability to understand and follow simple verbal instructions (MMSE-K score > 24) **Exclusion criteria:** participation in other studies or rehabilitation programmes, orthopaedic or other conditions or diseases that influence balance and gait such as arthritis or total hip joint replacement, use of balance-influencing drugs such as opiates or antibiotic streptomycin, severe defects in vision, and visual perception deficits that may affect the visual feedback trunk control training (Motor-Free Visual Perception Test score G20) **Pretreatment:** no differences were noted concerning general characteristics of the 2 groups, including age, weight, height, duration of stroke, type of stroke, hemiplegic side, and lesion site. **Sample size calculation:** to determine the sample size, G-Power 3.19 software was used. To calculate sample size, alpha error probability and power were set as 0.05 and 0.8, respectively. In addition, the effect size was set at 1.05 based on the result of TIS in a prior pilot test. Therefore, a sample size of 12 patients per group was necessary.
Interventions	**Intervention characteristics** Experimental training • Type of intervention: Smartphone-Based Visual Feedback Trunk Control Training System consisted of a smartphone inserted into a balance board where participants can be provided feedback regarding their trunk movements during trunk control training via this mirroring technique. The feedback provided by the monitor, as well as the opportunity to observe their own movements in real time, generates positive reinforcement, thus facilitating training and task improvement. The smartphone applications used in trunk control training were CSMi Centre of Pressure, CSMi Limits of Stability, CSMi Weight-Bearing Front-Back, CSMi Weight-Bearing Left-Right, CSMi Weight-Shift, and CSMi Animal Adventure

Shin 2016 *(Continued)*

- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 3 sessions/week, 4 weeks, 20 minutes
- Total minutes of intervention: 240
- Total minutes of conventional therapy: 360
- Content of standard care: personalised physical and occupational therapy and electrical stimulation therapy. Physical therapy consisted of neurodevelopmental and proprioceptive neuromuscular facilitation treatments. Occupational therapy consisted of functional exercise of the upper extremity to improve activities of daily living. Electrical stimulation therapy consisted of passively applied functional electrical stimulation (Microstim, Medel, Germany) to the lower extremity.
- Who provided study therapy: supervision of a physiotherapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): for each patient, the smartphone applications were applied by adjusting the level of difficulty according to his or her trunk control ability.
- Modification (intervention was modified during the course of the study?): not described
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): all participants in both groups completed the 4 weeks of intervention and assessments.
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: smartphone inserted into a balance board (Balance Top; Pedalo, Germany, 2014), monitor (SyncMaster B2430HD; Samsung Electronics, Korea, 2012), speaker (Bluetooth speaker sound drum BTS-D1; Iriver, Korea, 2014), and smartphone applications
- Reporting of death and serious adverse events, including falls: regarding the safety of SPVFTCT, no major adverse events or falls occurred during the intervention sessions. The fatigue (0.08 T 0.75) and pain intensity (0.02 T 0.55) associated with the trunk control training were extremely low. In addition, the perceived exertion during intervention sessions was considered fairly light (11.75 T 1.60)

Control group (no additional therapy)

- Type of intervention: not reported
- Length of intervention in minutes, days, or weeks: not reported
- Total number of repetitions: not reported
- Total minutes of intervention: not reported
- Total minutes of conventional therapy: 360
- Content of standard care: personalised physical and occupational therapy and electrical stimulation therapy. Physical therapy consisted of neurodevelopmental and proprioceptive neuromuscular facilitation treatments. Occupational therapy consisted of functional exercise of the upper extremity to improve activities of daily living. Electrical stimulation therapy consisted of passively applied functional electrical stimulation (Microstim, Medel, Germany) to the lower extremity.
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not described
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): all participants in both groups completed the 4 weeks of intervention and assessments.
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not described
- Material used: not described
- Reporting of death and serious adverse events, including falls: not described

Outcomes	Modified Functional Reach Test

- Outcome type: continuous outcome

Shin 2016 *(Continued)*

- Direction: higher is better
- Data value: change from baseline

Trunk function

- Outcome type: continuous outcome
- Scale: TIS 1.0
- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Walking ability

- Outcome type: continuous outcome
- Scale: TUG
- Unit of measure: s
- Direction: lower is better
- Data value: change from baseline

Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "For randomization, random allocation software was used." Judgement comment: the method and computer program were not specified in this trial.
Allocation concealment (selection bias)	Unclear risk	Judgement comment: no details were described.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Only the assessor was blinded.
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Only the assessor was blinded.
Incomplete outcome data (attrition bias) All outcomes	Low risk	Flow chart
Selective reporting (reporting bias)	Unclear risk	No registration available; only positive outcome measures were reported.
Other bias	Low risk	No other potential sources of bias found

Sun 2016

Study characteristics

Methods	**Study design:** RCT

Sun 2016 *(Continued)*

Study grouping: parallel group
Aim: to determine which is better in the rehabilitation of stroke patients: core-stability exercises or conventional exercises

Participants	**Baseline characteristics** Experimental training • Mean age and SD: not described • Number of participants: 20 • Sex (women/men): not described • Type of stroke event (I/H): not described • Location of stroke event (L/R): not described • Stroke severity at baseline, by means of the NIHSS or comparable scale: not described • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not described • Presence of other stroke-related impairments: not described • Comorbidity at baseline: not described • Mean time and SD after stroke in months: duration of disorder > 6 months, Control group (same amount of additional therapy) • Mean age and SD: not described • Number of participants: 20 • Sex (women/men): not described • Type of stroke event (I/H): not described • Location of stroke event (L/R): not described • Stroke severity at baseline, by means of the NIHSS or comparable scale: not described • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not described • Presence of other stroke-related impairments: not described • Comorbidity at baseline: not described • Mean time and SD after stroke in months: duration of disorder > 6 months, **Inclusion criteria:** ability to walk more than 32 feet, duration of disorder > 6 months, no musculoskeletal problems, absence of any cardiac disorders, complete understanding of this research, and ability to communicate **Exclusion criteria:** not reported **Pretreatment:** the baseline clinical data including age, gender, disease course, BBS, and MBI were recorded. There was no significant differences in baseline data between the two groups (P > 0.05). **Sample size calculation:** not calculated
Interventions	**Intervention characteristics** Experimental training • Type of intervention: the patients in the experiment group performed core-stability exercises including the plank, side plank, bridge, straight leg raise, and modified push-up. • Length of intervention in minutes, days, or weeks: 6 weeks • Total number of repetitions: 1 session/day, 6 sessions/week, 6 weeks, 60 minutes • Total minutes of intervention: 2160 • Total minutes of conventional therapy: not described • Content of standard care: not described • Who provided study therapy: physicians • How provided (face-to-face, internet, telephone, individual, in group): face-to-face

Sun 2016 *(Continued)*

- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): during the exercises, physicians provided necessary assistance to help the patients in executing the exercises.Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 3 patients dropped out
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: the patients in the control group performed conventional exercises including limb stretching, passive mobilisation of joints, walking between parallel bars, and occupational therapy.
- Length of intervention in minutes, days, or weeks: 6 weeks
- Total number of repetitions: 1 session/day, 6 sessions/week, 6 weeks, 60 minutes
- Total minutes of intervention: 2160
- Total minutes of conventional therapy: not described
- Content of standard care: not described
- Who provided study therapy: physicians
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): during the exercises, physicians provided necessary assistance to help the patients in executing the exercises.
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 2 patients dropped out.
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes	Modified Barthel Index • Outcome type: continuous outcome Berg Balance Scale • Outcome type: continuous outcome
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "randomly divided into either an experimental or control group by a random computer-generated sequence."
Allocation concealment (selection bias)	Low risk	Quote: "The group allocations were concealed in numbered, sealed, opaque envelopes."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not described if personnel and participants were blinded

Sun 2016 *(Continued)*

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not described if assessor was blinded
Incomplete outcome data (attrition bias) All outcomes	High risk	Quote: "Three patients in the experimental group and two in the control group withdrew from the study two weeks after treatment, and in total thirty-five patients completed the training." Judgement comment: no reasons for dropout were mentioned.
Selective reporting (reporting bias)	Unclear risk	Not clearly described to rule out 'low risk' or 'high risk'
Other bias	Unclear risk	Not clear if any other forms of biases were reduced to permit 'low risk' or 'high risk'

Thijs 2021

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to investigate the feasibility, safety, and potential effectiveness of technology-supported sitting balance therapy by using T-Chair ... a single centre pilot randomised controlled trial (RCT) with participants in the chronic phase after stroke with the primary objective of investigating the feasibility and safety of sitting balance therapy enhanced with the T-Chair. The secondary objective was to evaluate whether utilising technology-assisted therapy, in addition to usual care, improved sitting balance, trunk function, mobility, functional balance, strength, and ADL in participants post stroke, as compared with usual care only.
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 54.20 ± 11.46 • Number of participants: 15 • Sex (women/men): 7/8 • Type of stroke event (I/H): 8/7 • Location of stroke event (L/R): 8/6 • Stroke severity at baseline, by means of Barthel Index: 18 ± 4 • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not described • Presence of other stroke-related impairments: not described • Comorbidity at baseline: not described • Mean time and SD after stroke in days: 1913 ± 2834 Control group (not same amount of additional therapy) • Mean age and SD: 49.07 ± 13.99 • Number of participants: 15 • Sex (women/men): 8/7 • Type of stroke event (I/H): 10/5 • Location of stroke event (L/R): 5/10 • Stroke severity at baseline, by means of Barthel Index: 19 ± 3 • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not described • Presence of other stroke-related impairments: not described

Thijs 2021 *(Continued)*

- Comorbidity at baseline: not described
- Mean time and SD after stroke in days: 1177 ± 1375

Inclusion criteria: had suffered a first stroke more than six months previously; they were 18 years or older; they had impaired trunk function (score ≤ 19 on TIS; they were able to maintain a seated position independently for more than 10 s; they were able to travel to the study location; they had no significant comorbidities (other than stroke) affecting trunk function; they had sufficient cognitive and language capacity to understand and perform the study protocol; they provided written informed consent

Exclusion criteria: participants were excluded if they did not meet one or more inclusion criteria.

Pretreatment: no baseline group difference. Groups different before the intervention for maximum walking speed

Sample size calculation: because of the pilot nature of the study, a sample size calculation was not required. However, by comparison with previously conducted trials with a similar design, and recommendations by Whitehead 2015, a sample of 15 participants in each arm of the trial was considered sufficient to be able to answer the research questions.

Interventions

Intervention characteristics

Experimental training

- Type of intervention: sitting balance therapy was conducted in a seated position and consisted of predefined, standardised exercises, including reaching training, lateral trunk lengthening and shortening, weight-shift training, pelvic-tilt exercises, and training while sitting on an unstable surface.
- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 3 sessions/week, 4 weeks, 50 minutes/session
- Total minutes of intervention: 600
- Total minutes of conventional therapy: 3 sessions of 30 minutes and 2 hours therapy per week
- Content of standard care: participants in the control group received usual care only, with no time spent on sitting balance therapy
- Who provided study therapy: one study therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): the therapist scored the safety of the participant while training, during and at the end of each training session on a 0–10 numerical rating scale (NRS), where higher scores represent better safety. Participants rated tiredness of leg and trunk muscles after each session, also on a 0–10 NRS, where higher scores represent greater fatigue. To determine whether the level of training was too easy, too difficult or just right, safety and tiredness scores were considered after each session. When training was scored as safe (NRS > 5) and tiredness was moderate (an average NRS of < 5), training difficulty was increased to the next level, according to a standardised scheme, evolving to movements with a greater range of motion and/or less stable seated support.
- Modification (intervention was modified during the course of the study?): no
- How well (If intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): one dropout (6%)
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): the Pittsburgh rehabilitation participation scale assessed participation. The therapist judged participation on a six-point Likert scale, ranging from poor to excellent. Adherence was evaluated using the Clinician Rating of Compliance Scale, a seven-point ordinal scale. A score lower than five is defined as non-adherent; a score of six indicates moderate adherence, with some knowledge and interest, with no prompting required; a score of seven represents active adherence, with the participant showing responsibility for the therapy regimen. One participant in the experimental group dropped out (3%): this person had a back injury due to heavy lifting (unrelated to the study) and was unable to continue with the protocol and post-intervention evaluation. The other participants in the experimental group were able to complete all 12 intervention sessions (100%). Retention in the experimental group was high with 14 participants completing all treatment sessions and the final assessment (93%) and 29 completing all evaluations (97%)
- Material used: T-chair, blocks, ping pong balls, bucket, cones, skipping rope, seed bags, hula hoop

Thijs 2021 *(Continued)*

- Reporting of death and serious adverse events, including falls: during and after therapy, a limited number of therapy-related adverse events occurred. One participant fell once during the cooling-down period in the first therapy week while not wearing the safety belt, but sustained no injury; three different participants indicated muscle soreness after therapy (shoulder, hip, and back regions). Fatigue (general, and of the leg and trunk) was found acceptable, given the intensity of the therapy, with mean scores between 5 and 21 (out of 30), corresponding to mild to moderate fatigue. A similar result was noted with the Borg Rating of Perceived Exertion, with mean scores across sessions between 10 and 13.5 (out of 20), indicating that therapy was perceived between fairly light and somewhat hard.

Control group (different amount of additional therapy)

- Type of intervention: no additional therapy
- Length of intervention in minutes, days, or weeks: not reported
- Total number of repetitions: not reported
- Total minutes of intervention: not reported
- Total minutes of conventional therapy: 3 sessions of 30 minutes and 2 hours therapy per week
- Content of standard care: participants in the control group received usual care only, with no time spent on sitting balance therapy
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (If the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes

Trunk function

- Outcome type: continuous outcome
- Scale: TIS 1.0
- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Walking ability

- Outcome type: continuous outcome
- Scale: Ten-Meter Walk Test
- Unit of measure: m/s
- Direction: higher is better
- Data value: change from baseline

Standing balance

- Outcome type: continuous outcome
- Scale: Berg Balance Scale
- Range: 0-56
- Direction: higher is better
- Data value: change from baseline
- Outcome reported as median and interquartile range

Activities of daily living

- Outcome type: continuous outcome

Thijs 2021 *(Continued)*

- Scale: Barthel Index
- Range: 0-20
- Direction: higher is better
- Data value: change from baseline
- Outcome reported as median and interquartile range

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "The principal investigator (GV) randomly allocated participants, after consent, to two different groups, experimental and control. The principal investigator (GV) used the coin flip randomization method..."
Allocation concealment (selection bias)	Low risk	Allocation was concealed according to authors.
Blinding of participants and personnel (performance bias) All outcomes	High risk	No blinding of participants and personnel
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote:"The assessor and data analyst (LT) was blinded throughout all assessments (three measurement points) and analyses."
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Quote: "One participant in the experimental group dropped out (3%): this person had a back injury due to heavy lifting (unrelated to the study) and was unable to continue with the protocol and post-intervention evaluation. The other participants in the experimental group were able to complete all 12 intervention sessions (100%). Retention in the experimental group was high with 14 participants completing all treatment sessions and the final assessment." Judgement comment: reasons for dropouts were mentioned.
Selective reporting (reporting bias)	Unclear risk	Not clearly described to rule out 'low risk' or 'high risk'
Other bias	Unclear risk	Not clear if any other forms of biases were reduced to permit 'low risk' or 'high risk'

Van Criekinge 2020

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to investigate whether reported mobility improvements are associated with the changes observed in trunk motion. To examine which improvements in gait and trunk parameters are associated with the observed carry-over effects of the primary mobility outcome measure
Participants	**Baseline characteristics** Experimental training

Van Criekinge 2020 *(Continued)*

- Mean age and SD: 61.4 ± 10.3
- Number of participants: 19
- Sex (women/men): 11/8
- Type of stroke event (I/H): 16/3
- Location of stroke event (L/R): 14/5
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in days: 52.5 ± 29.0

Control group (same amount of additional therapy)

- Mean age and SD: 63.6 ± 14.4
- Number of participants: 20
- Sex (women/men): 13/7
- Type of stroke event (I/H): 13/7
- Location of stroke event (L/R): 13/7
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in days: 59.9 ± 36.0

Inclusion criteria: adults diagnosed with a haemorrhagic or ischaemic stroke within 5 months, had a confirmed unilateral localisation of the stroke verified by medical imaging, and without a history of previous stroke

Exclusion criteria: (1) a score of 20 or higher on the TIS; (2) a score lower than 2 on the Functional Ambulation Categories; (3) unable to sit independently with foot contact on a stable surface for 30 seconds; (4) a neurological or orthopaedic disorder, except for stroke, which could affect motor performance or balance; (5) a communication disorder that limits the understanding of verbal instructions; (6) patients over the age of 85 years;and (7) contraindications to physical activity (e.g. heart failure) were present or excessive physical activity was deemed unsafe by the physician

Pretreatment: no significant differences were found in the baseline comparison, except for step length (mean difference of 9 cm; t37 = 2.03; P = 0.05).

Sample size calculation: not calculated

Interventions

Intervention characteristics

Experimental training

- Type of intervention: trunk training: core-stability exercises in a supine and seated position (e.g. uni- and bilateral bridging, reaching, and sit-ups) on both stable and unstable surfaces. Selective flexion/extension of the lower trunk; pelvic bridging: lifting pelvis in crook lying with both feet supported; pelvic bridging: lifting pelvis with lower limbs supported on physio ball; unilateral pelvic bridging: lifting pelvis in crook lying with one foot supported; unilateral pelvic bridging: lifting pelvis with one leg supported on physio ball; pelvic bridging with displacements: lifting pelvis in crook lying and placing pelvis left and right of midline; pelvic bridging with displacements: lifting pelvis with lower limbs supported on physio ball and place pelvis left and right from midline; lower trunk rotation: moving the lower limbs from left to right in crook lying; lower trunk rotation: moving the lower limbs from left to right with legs supported on physio ball; lower trunk flexion: lifting lower limbs symmetrically to chest in crook lying; lower trunk flexion: moving the lower limbs symmetrically to chest with lower limbs supported on physio ball; upper trunk flexion: lifting shoulder girdle symmetrically in crook lying; upper trunk flexion: lifting shoulder girdle symmetrically with lower limbs supported on physio ball; upper trunk flexion rotation: lifting shoulder girdle asymmetrically in crook lying; upper trunk flexion rotation: lifting shoulder girdle asymmetrically with lower limbs supported on physio ball; lower trunk

Van Criekinge 2020 *(Continued)*

flexion rotation: lifting lower limbs asymmetrically to chest in crook lying; lower trunk flexion rotation: moving the lower limbs asymmetrically to chest with lower limbs supported on physio ball. Selective flexion/extension of the lower trunk; selective flexion/extension of the lower trunk while seated on physio ball; selective lengthening and shortening of one side of the trunk; selective lengthening and shortening of one side of the trunk while seated on physio ball; upper trunk lateral flexion: initiating movement from the shoulder girdle; external and internal perturbations while seated on physio ball; lower trunk lateral flexion: initiating movement from the pelvic girdle; upper trunk lateral flexion: initiating movement from the shoulder girdle while seated on physio ball; upper trunk rotation: moving each shoulder forward and backwards; lower trunk lateral flexion: initiating movement from the pelvic girdle while seated on physio ball; forward reach: reaching the arms out forwards from the trunk; upper trunk rotation: moving each shoulder forward and backwards while seated on physio ball; lateral reach: reaching the arms out sideways from the trunk; weight-shifting while seated on physio ball; shuffling forward and backward on hard surface; forward reach: reaching the arms out forwards from the trunk while seated on physio ball; lateral reach: reaching the arms out sideways from the trunk while seated on physio ball

- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 4 days/week, 4 weeks, 60 minutes each session
- Total minutes of intervention: 960
- Total minutes of conventional therapy: 1200
- Content of standard care: multidisciplinary standard inpatient care, which consisted of 1 hour of physical therapy and 1 hour of occupational therapy. Standard care mainly consisted of muscle strengthening; activities enhancing motor control of the arms, legs, and trunk by applying appropriate motor relearning strategies; and at later stages also gait rehabilitation.
- Who provided study therapy: physical therapists
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (If the intervention was intended to be personalised, titrated or adapted? What and how?): progression will be implemented in a standardised manner and determined by the physiotherapist based on the patient's performance. (1) reducing base of support, (2) increasing the lever arm, (3) increasing limits of stability, (4) increasing the hold time, (5) increasing the number of repetitions, and (6) presence of visual feedback.
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): problems with fatigue (n = 3)
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: physio ball
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: cognitive training: cognitive exercises to ensure a useful task in which trunk activity could be excluded: the RevArte Visual Search Test and the Visuospatial Neglect Test Battery were performed.
- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 4 days/week, 4 weeks, 60 minutes each session
- Total minutes of intervention: 960
- Total minutes of conventional therapy: 1200
- Content of standard care: multidisciplinary standard inpatient care, which consisted of 1 hour of physical therapy and 1 hour of occupational therapy. Standard care mainly consisted of muscle strengthening; activities enhancing motor control of the arms, legs, and trunk by applying appropriate motor relearning strategies; and at later stages also gait rehabilitation.
- Who provided study therapy: physical therapists
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported

Van Criekinge 2020 *(Continued)*

- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): because of an early discharge (n = 1) and problems with fatigue (n = 2)
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: Metrisquare DiagnoseIS software platform, Wacom pen display
- Reporting of death and serious adverse events, including falls: not reported

Outcomes	Trunk function • Outcome type: continuous outcome • Scale: TIS 1.0 • Range: 0-23 • Direction: higher is better • Data value: change from baseline Walking ability • Outcome type: continuous outcome • Scale: walking speed • Unit of measure: m/s • Direction: higher is better • Data value: change from baseline Standing balance • Outcome type: continuous outcome • Scale: Tinetti POMA • Range: 0-28 • Direction: higher is better • Data value: change from baseline TIS 1.0 • Outcome type: continuous outcome • Direction: higher is better • Data value: change from baseline Gait speed (m/s) • Outcome type: continuous outcome • Direction: higher is better • Data value: change from baseline Tinetti-POMA (balance and gait) • Outcome type: continuous outcome • Range: 0-28 • Direction: higher is better • Data value: change from baseline Tinetti gait • Outcome type: continuous outcome • Range: 0-12 • Direction: higher is better • Data value: change from baseline Tinetti balance

Van Criekinge 2020 *(Continued)*

- Outcome type: continuous outcome
- Range: 0-16
- Direction: higher is better
- Data value: change from baseline

Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Judgement comment: participants will be randomly allocated to either the experimental or the control group by simple randomisation executed by an independent researcher who is not involved in the assessment or treatment of the patients. Study protocol
Allocation concealment (selection bias)	Low risk	Judgement comment: a blinded investigator will allocate patients to the control or the experimental group by means of concealed envelopes which will be kept off site.
Blinding of participants and personnel (performance bias) All outcomes	High risk	Judgement comment: although we will try to blind patients, therapists, and assessors, it is unlikely that patients and therapists will stay blind during the course of this study due to the nature of the applied treatment. However, to make sure that the risk of bias stays low, patients will be registered in the database by means of a patient ID code so assessors are blinded during analysis. Only the primary investigator will have knowledge regarding allocation.
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Judgement comment: although we will try to blind patients, therapists, and assessors, it is unlikely that patients and therapists will stay blind during the course of this study due to the nature of the applied treatment. However, to make sure that the risk of bias stays low, patients will be registered in the database by means of a patient ID code so assessors are blinded during analysis. Only the primary investigator will have knowledge regarding allocation.
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "found as Supplementary Figure 1. Six participants did not fullfil the complete treatment because of problems with fatigue (n = 3) in the experimental group and because of an early discharge (n = 1) and problems with fatigue (n = 2) in the control group. The analysis and results are therefore based on the 39 participants who completed the full treatment. No significant differences were found."
Selective reporting (reporting bias)	Low risk	Judgement comment: study registration was available. All outcome measures were reported.
Other bias	Low risk	No other potential sources of bias found

Varshney 2019

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to study the effect of Swiss ball activities on trunk control in post-stroke patients
Participants	**Baseline characteristics**

Varshney 2019 *(Continued)*

Experimental training

- Mean age and SD: 40-65 years
- Number of participants: 15
- Sex (women/men): both genders
- Type of stroke event (I/H): not reported
- Location of stroke event (L/R): not reported
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: post-stroke patients up to 3 months

Control group (no additional therapy)

- Mean age and SD: 40-65 years
- Number of participants: 15
- Sex (women/men): both genders
- Type of stroke event (I/H): not reported
- Location of stroke event (L/R): not reported
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: post stroke patients up to 3 months

Inclusion criteria: post-stroke patients up to 3 months, both ischaemic or haemorrhagic with first onset of unilateral lesion, medically stable, able to understand and follow simple verbal instruction, scoring >/= 24 on MMSE, could sit unsupported for 1 minute on a stable surface with feet touching the ground, > 13 PASS (TC), > 8 TIS

Exclusion criteria: any neurological disease and musculoskeletal disorders affecting trunk control other than stroke, history of surgery due to musculoskeletal diseases affecting motor control

Pretreatment: no significant differences between the groups were found for the demographic variables: “P values” for age (0.178), gender (0.723), affected side right/left (0.716). There were no significant differences in stroke-related parameters and outcome measures between the groups:“P values” for TIS (0.717), PASS (1.0), and MMSE(0.481).

Sample size calculation: not calculated

Interventions

Intervention characteristics

Experimental training

- Type of intervention: Swiss ball protocol: the number of repetitions was determined on the basis of an earlier pilot study. A practice trial was provided on the Swiss ball before performing the exercise protocol with the experimental group. The exercise protocol started from the next day which included the Swiss ball exercise protocol for 20 minutes. Trunk exercises on the Swiss ball were initiated with mild assistance and further progressed to no assistance. These exercises were to be performed with an adequate rest period in between. Swiss ball exercises; supine: bridging, unilateral bridging, lower trunk, rotation, sitting: static sitting balance, trunk flexion–extension, trunk lateral flexion, trunk rotators-upper trunk, lower trunk, weight shifts, forward reach, lateral reach
- Length of intervention in minutes, days, or weeks: 3 weeks
- Total number of repetitions: 4 sessions/week, 3 weeks, 20 minutes each session
- Total minutes of intervention: 240
- Total minutes of conventional therapy: not described
- Content of standard care: conventional physiotherapy

Varshney 2019 *(Continued)*

- Who provided study therapy: not described
- How provided (face-to-face, Internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not described
- Modification (intervention was modified during the course of the study?): not described
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): 2 participants dropped out
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not described
- Material used: not described
- Reporting of death and serious adverse events, including falls: not reported

Control group (no additional therapy)

- Type of intervention: not reported
- Length of intervention in minutes, days, or weeks: not reported
- Total number of repetitions: not reported
- Total minutes of intervention: not reported
- Total minutes of conventional therapy: not described
- Content of standard care: conventional physiotherapy
- Who provided study therapy: not described
- How provided (face-to-face, internet, telephone, individual, in group): not described
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes	Trunk function • Outcome type: continuous outcome • Scale: TIS 1.0 • Range: 0-23 • Direction: higher is better • Data value: change from baseline
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomisation was not described with enough details.
Allocation concealment (selection bias)	Unclear risk	Allocation was not described.
Blinding of participants and personnel (performance bias)	Unclear risk	Blinding was not described.

Varshney 2019 *(Continued)*

All outcomes		
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Blinding was not described.
Incomplete outcome data (attrition bias) All outcomes	High risk	Quote: "During the course 2 participants discontinued interventions in experimental group." Judgement comment: 2 dropouts in the experimental group; the reasons for dropouts were not given.
Selective reporting (reporting bias)	Unclear risk	Judgement comment: no trial registration available
Other bias	Unclear risk	Judgement comment: we could not rule out any other bias.

Verheyden 2009

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to investigate the effect of additional exercises, aimed at improving sitting balance and selective-trunk movements, on trunk performance after stroke
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 55 ± 11 • Number of participants: 17 • Sex (women/men): 6/11 • Type of stroke event (I/H): 15/2 • Location of stroke event (L/R): 9/8 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in days: 53 ± 24 Control group (no additional therapy) • Mean age and SD: 62 ± 14 • Number of participants: 16 • Sex (women/men): 7/9 • Type of stroke event (I/H): 13/3 • Location of stroke event (L/R): 7/9 • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in days: 49 ± 28

Verheyden 2009 *(Continued)*

Inclusion criteria: participants were recruited if they attended the in patient stroke rehabilitation programme and had a hemiparesis that was stroke-related.

Exclusion criteria: patients were excluded from the study if they were 80 years of age or older, were not able to understand the instructions, had other disorders that could affect motor performance, or obtained a maximum trunk performance score at the start of the study.

Pretreatment: no significant differences were found between participants in the experimental and control groups for the collected demographic variables, stroke-related parameters, clinical measures, number of physiotherapy and occupational therapy sessions received over the 5-week period, and primary outcome measure used in this study.

Sample size calculation: not calculated

Interventions

Intervention characteristics

Experimental training

- Type of intervention: the additional exercises consisted of selective movements of the upper and lower part of the trunk in supine and sitting. Supine exercises, with the legs bent and the feet resting on the treatment table, included selective anterior-posterior movements of the pelvis, extension of the hips (bridging), and rotation of the trunk initiated from the upper and lower part of the trunk. Exercises in a sitting position included: flexion and extension of the trunk (the patient flexes and extends the trunk without moving the trunk forwards or backwards); flexion and extension of the lumbar part of the spine (this involves selective anteflexion and retroflexion of the lower part of the trunk); flexion and extension of the hips with the trunk extended (with an extended trunk, the movement is initiated in the hips and the patient brings the extended trunk forwards and backwards); lateral flexion of the trunk initiated from the shoulder and pelvic girdle (from the shoulder girdle means that the patient touches the exercise table with one elbow and returns to the starting position, from the pelvic girdle means that the patient lifts one side of the pelvis and returns to the starting position); rotation from the upper and lower part of the trunk (from the upper part of the trunk means that the patient moves each shoulder forwards and backwards, from the lower part of the trunk means that the patient, while sitting in the upright position, moves each knee forwards and backwards); and shuffling forwards and backwards on an exercise table (the participant shifts the weight from one side to the other and moves forwards and backwards on the exercise table)
- Length of intervention in minutes, days, or weeks: 5 weeks
- Total number of repetitions: 4 sessions/week, 4 weeks, 30 minutes each session
- Total minutes of intervention: 600
- Total minutes of conventional therapy: 22 sessions of physiotherapy, 22 sessions of occupational therapy
- Content of standard care: the conventional treatment programme is patient-specific and consists mainly of physiotherapy, occupational therapy, and nursing care. Neuropsychological and speech therapy are provided if needed. Therapists combine elements from different neurological treatment concepts but the main emphasis is on the neurodevelopmental treatment concept and on motor relearning strategies.
- Who provided study therapy: therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): exercises were gradually introduced and the number of repetitions was determined by the therapist on the basis of the patients' performance.
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): no dropouts during the course of the study, but 2 patients in the experimental group had 3 and 4 fewer hours of additional therapy sessions because of early discharge from the rehabilitation centre.
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: exercise table
- Reporting of death and serious adverse events, including falls: not reported

Verheyden 2009 *(Continued)*

	Control group (no additional therapy) • Type of intervention: not reported • Length of intervention in minutes, days, or weeks: not reported • Total number of repetitions: not reported • Total minutes of intervention: not reported • Total minutes of conventional therapy: 24 sessions of physiotherapy, 24 sessions of occupational therapy • Content of standard care: the conventional treatment programme is patient-specific and consists mainly of physiotherapy, occupational therapy, and nursing care. Neuropsychological and speech therapy are provided if needed. Therapists combine elements from different neurological treatment concepts but the main emphasis is on the neurodevelopmental treatment concept and on motor relearning strategies. • Who provided study therapy: not reported • How provided (face-to-face, internet, telephone, individual, in group): not reported • Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported • Modification (intervention was modified during the course of the study?): not reported • How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): in the control group, 3 patients were discharged after 21, 23, and 25 days. • How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported • Material used: not reported • Reporting of death and serious adverse events, including falls: not reported
Outcomes	Trunk function • Outcome type: continuous outcome • Scale: TIS 1.0 • Range: 0-23 • Direction: higher is better • Data value: change from baseline
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Prior to the initial evaluation, participants were divided by simple randomization into an experimental or control group. Randomization was done by a person who was not involved in the assessment or treatment of the patients."
Allocation concealment (selection bias)	Low risk	Judgement comment: simple randomisation and allocation done by a third person not involved in the treatment.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Judgement comment: there was no reporting of blinding the participants or personnel.
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "assessor-blinded randomized"

Verheyden 2009 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "There were no dropouts during the course of the study, but 2 patients in the experimental group had 3 and 4 fewer hours of additional therapy sessions because of early discharge from the rehabilitation center (20 and 21 days after inclusion in the study). In the control group, 3 patients were discharged after 21, 23, and 25 days, respectively. All participants were evaluated before discharge from the rehabilitation center and included in the analysis." Judgement comment: reasons for dropouts were described and data were included in the analysis.
Selective reporting (reporting bias)	Unclear risk	Judgement comment: no study registration was available and trunk function was reported. At baseline, other outcomes were measured (Tinetti). However, the results post-intervention were not reported. The outcome on TIS reported no significant difference between groups.
Other bias	Low risk	No other potential sources of bias found

Viswaja 2015

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to compare the effectiveness of trunk training exercises and Swiss ball exercises on sitting balance and gait in stroke patients
Participants	**Baseline characteristics** Experimental training • Mean age and SD: between 50-70 years • Number of participants: 30 • Sex (women/men): not reported • Type of stroke event (I/H): not reported • Location of stroke event (L/R): not reported • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: not reported Control group (same amount of additional therapy) • Mean age and SD: between 50-70 years • Number of participants: 30 • Sex (women/men): not reported • Type of stroke event (I/H): not reported • Location of stroke event (L/R): not reported • Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in months: not reported

Viswaja 2015 *(Continued)*

Inclusion criteria: first onset of unilateral stroke, independent ability to sit for 30 seconds, the ability to reach with intact arm, age between 50-70 years

Exclusion criteria: the exclusion criteria for this study involved neurological disease affecting balance other than stroke, visual problems which would interfere with reaching to pick up objects, vestibular lesions, hemispatial neglect, musculoskeletal disorders of trunk or lower extremities affecting the motor performance, cardiovascular conditions like myocardial infarction, Pusher's syndrome, cognitive impairments, severe aphasia.

Pretreatment: not evaluated

Sample size calculation: not calculated

Interventions

Intervention Characteristics

Experimental training

- Type of intervention: supine exercises: bridging; unilateral bridging; trunk rotations (upper trunk and lower trunk); sitting exercises: static sitting balance; trunk flexion: flexion-extension of the hip; trunk lateral flexion; trunk rotations (upper trunk and lower trunk); weight shifts; forward reach; lateral reach; perturbations. On a Swiss ball
- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 5 sessions/week, 4 weeks, 30 minutes each session
- Total minutes of intervention: 600
- Total minutes of conventional therapy: not reported
- Content of standard care: conventional therapy
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): not reported
- Tailoring (If the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (If intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (If intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: Swiss ball
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: it was designed to improve sitting by reaching beyond arms length using the unaffected hand while focusing on smooth co-ordinated motion of the trunk and arm to get the object; appropriate loading of affected foot, preventing the use of mal adaptive strategies like widening base of support. Sitting with feet touching ground and reaching with unaffected arm in forward and across direction, for example, reaching to grasp and drink a glass of water from all directions. While reaching beyond arms length, reach distance, direction and task were varied systematically. Core-stability exercises were given to enhance the trunk stability. The core-stability-enhancing programme was performed as follows. All core-stability-enhancing exercises were preceded by reducing lumbar lordosis by placing a pillow under both knee joints. Shoulder was placed in abduction and a towel placed under the scapula to prevent the compensatory action of pectoralis major. The neck was aligned by flexing the abdominal region. From this position, the subject was asked to contract the multifidus and flexor muscles simultaneously. The upper back was lifted and twisted in the diagonal direction so that the right hand could face the left knee. The therapist could assist by providing minimum help for patients who had difficulty in doing it due to weak abdominals. This exercise was repeated on the other side, while performing this to see that the head and jawline were not twisted.
- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 5 sessions/week, 4 weeks, 30 minutes each session
- Total minutes of intervention: 600
- Total minutes of conventional therapy: not reported

Viswaja 2015 *(Continued)*

- Content of standard care: conventional therapy
- Who provided study therapy: therapist
- How provided (face-to-face, internet, telephone, individual, in group): not described
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not described
- Modification (intervention was modified during the course of the study?): not described
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not described
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not described
- Material used: not described
- Reporting of death and serious adverse events, including falls: not reported

Outcomes	Trunk function • Outcome type: continuous outcome • Scale: TIS 1.0 • Range: 0-23 • Direction: higher is better • Data value: change from baseline
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "These 60 subjects were randomized into two groups, trunk training and Swiss ball group by simple random sampling. Subjects were selected by lottery method."
Allocation concealment (selection bias)	Unclear risk	Judgement comment: not reported how allocation was performed
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not described if participants or personnel were blinded
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Judgement comment: no blinding
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Judgement comment: we could not find any details from baseline characteristics.
Selective reporting (reporting bias)	High risk	Judgement comment: no registration was available, no baseline characteristics
Other bias	Unclear risk	Judgement comment: no details about selection were provided.

Yoo 2010

Study characteristics	
Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to examine the effect of a core strengthening programme in the trunk balance of stroke patients, and to search for association between trunk balance, cognitive function, and activities of daily living
Participants	**Baseline characteristics** Experimental training • Mean age and SD: 59.61 ± 18.16 • Number of participants: 28 • Sex (women/men): 15/13 • Type of stroke event (I/H): 14/14 • Location of stroke event (L/R): 11/17 • Stroke severity at baseline, by means of the Modified Barthel index: 41.32 ± 20.05 • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in days: 42.86 ± 35.08 Control group (same amount of additional therapy) • Mean age and SD: 61. 77 ± 12.58 • Number of participants: 31 • Sex (women/men): 14/17 • Type of stroke event (I/H): 15/16 • Location of stroke event (L/R): 12/19 • Stroke severity at baseline, by means of the Modified Barthel index: 41.39 ± 21.48 • Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported • Presence of other stroke-related impairments: not reported • Comorbidity at baseline: not reported • Mean time and SD after stroke in days: 48.03 ± 29.45 **Inclusion criteria:** acute and subacute stroke patients **Excluded criteria:** this study excluded patients who could not communicate with the therapist (severe aphasia, cognitive impairment), patients who were paralysed on both sides, patients who were suffering from other neurologic diseases, patients with neurologic deficit, neglect, and patients with severe internal diseases and severe back pain or other musculoskeletal disorder. **Pretreatment:** both the experimental group and the control group had similar conditions: demographic, paralysed side, the time gap between stroke and rehabilitation, MMSE-K, and Korean modified Barthel index before the physical therapy began. **Sample size calculation:** not calculated
Interventions	**Intervention characteristics** Experimental training • Type of intervention: the core training adopted various exercise methods. This study adopted deep breathing using association. After the pilot study, 9 suitable core-strengthening methods were selected and divided into 3 steps based on the level of difficulty. After finishing deep breathing, patients started with easy exercises and progressed to more challenging exercises. Some patients repeated low-level exercise and could not progress to more difficult exercise. Some patients who did not have enough muscle strength were assisted by therapists during exercise and both the affected and non-affected sides were exercised.

Yoo 2010 *(Continued)*

- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 3 sessions/week, 4 weeks, 30 minutes each session
- Total minutes of intervention: 360
- Total minutes of conventional therapy: 3 times a week for 4 weeks
- Content of standard care: physical therapy
- Who provided study therapy: physical therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): patients started with easy exercises and progressed to more challenging exercises. Some patients repeated low-level exercise and could not progress to more difficult exercise. Some patients who did not have enough muscle strength were assisted by therapists during exercise and both the affected and non-affected sides were exercised.
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: exercise table
- Reporting of death and serious adverse events, including falls: not reported

Control group (same amount of additional therapy)

- Type of intervention: patients tried a neurodevelopmental technique, walking, and occupational therapy.
- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: 3 sessions/week, 4 weeks, 30 minutes each session
- Total minutes of intervention: 360
- Total minutes of conventional therapy: 3 times a week for 4 weeks
- Content of standard care: physical therapy
- Who provided study therapy: physical therapist
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes

Trunk Control Test

- Outcome type: continuous outcome
- Range: 0-100
- Direction: higher is better
- Data value: change from baseline

Trunk function

- Outcome type: continuous outcome
- Scale: TIS 1.0
- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Yoo 2010 *(Continued)*

Standing balance

- Outcome type: continuous outcome
- Scale: Berg Balance Scale
- Range: 0-56
- Direction: higher is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "The study included 59 subjects who were randomly divided into two groups: in the experimental group (n = 28) and the control group (n = 31)." Judgement comment: no details were available on how the authors randomised participants.
Allocation concealment (selection bias)	Unclear risk	Judgement comment: the study included 59 subjects who were randomly divided into two groups: in the experimental group (n = 28) and the control group (n = 31). No details were available on how allocation was concealed.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Judgement comment: no blinding of participants or personnel
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not described if assessor was blinded
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Judgement comment: no dropouts were mentioned.
Selective reporting (reporting bias)	Low risk	Judgement comment: no registration was available. Significant and insignificant data were reported.
Other bias	Low risk	No other potential sources of bias found

Yu 2013

Study characteristics

Methods	**Study design:** RCT **Study grouping:** parallel group **Aim:** to compare the core muscle activity of patients with CVA-induced hemiplegia before and after treatment for improving core stability; to estimate the change in core muscle activity by using surface electromyography and the trunk impairment scale, and provide baseline data for core-stability rehabilitation programmes
Participants	**Baseline characteristics** Experimental training

Yu 2013 *(Continued)*

- Mean age and SD: 50.00 ± 5.53
- Number of participants: 10
- Sex (women/men): not reported
- Type of stroke event (I/H): not reported
- Location of stroke event (L/R): 2/5
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 25.85 ± 9.99

Control group (no additional therapy)

- Mean age and SD: 52.64 ± 4.56
- Number of participants: 10
- Sex (women/men): not reported
- Type of stroke event (I/H): not reported
- Location of stroke event (L/R): 5/6
- Stroke severity at baseline, by means of the NIHSS or comparable scale: not reported
- Hyper-acute treatment of stroke (e.g. thrombolytic therapy): not reported
- Presence of other stroke-related impairments: not reported
- Comorbidity at baseline: not reported
- Mean time and SD after stroke in months: 30.96 ± 7.67

Inclusion criteria: ability to walk for more than 32 feet, duration of disorder > 6 months, do not have any problem in musculoskeletal model, absence of a cardiac disorder, complete understanding of this research, and ability to communicate

Exclusion criteria: not reported

Pretreatment: group differences were not evaluated with a statistical test.

Sample size calculation: not calculated

Interventions

Intervention characteristics

Experimental training

- Type of intervention: all core-stability-enhancing exercises were preceded by reducing lumbar lordosis while the patient was lying correctly on an adjustable treatment table. After extending the hip and knee joints, both the hip and knees were supported by a pillow to maintain this posture. Additionally, to compensate for the action of the flexor muscle, the hip joint was blocked in advance by keeping the legs in a relaxed position. Next, the blade bone was retracted such that the shoulder girdle was positioned in abduction, and a towel was placed below the blade bone to prevent the pectoralis major from performing a compensatory action via relaxing both shoulders. Another preparatory step was enhancing the stability of the neck region. For this, the head was lifted and held in this position by flexing the abdominal region. At the same time, the neck was pulled down to prevent the column from bending. In addition, the multifidus and flexor muscles were contracted simultaneously. Maintaining this posture, the upper part of the back was lifted as much as possible and twisted slightly in a diagonal direction so that the right hand could face the left knee. This position was maintained for a moment before lowering the back. At this moment, the left arm was aligned, and therapists led in the right direction and provided minimum help for patients who had difficulty in doing it due to weak abdominal muscles in order for them to control it by themselves. This exercise was repeated; only this time the left hand faced the right knee for enhancing the abdominal muscles on the left. While maintaining this position, the jaw had to be in the middle of the chest, and care had to be taken so that the jaw was not twisted. All these exercises enhanced the stability of core muscles. Particularly, the transversus abdominis and oblique muscles were strengthened when the multifidus and abdominal muscles were simultaneously contracted.
- Length of intervention in minutes, days, or weeks: 4 weeks

Yu 2013 *(Continued)*

- Total number of repetitions: 5 sessions/week, 4 weeks, 30 minutes each session
- Total minutes of intervention: 600
- Total minutes of conventional therapy: not reported
- Content of standard care: kinesiatrics was employed to not only teach patients how to support and move weights but also improve their flexibility and movable range of joint via joint exercises.
- Who provided study therapy: therapists
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): no
- Modification (intervention was modified during the course of the study?): no
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): dropouts of candidates were not mentioned
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported.

Control group (no additional therapy)

- Type of intervention: not reported
- Length of intervention in minutes, days, or weeks: 4 weeks
- Total number of repetitions: not reported
- Total minutes of intervention: not reported
- Total minutes of conventional therapy: not reported
- Content of standard care: kinesiatrics was employed to not only teach patients how to support and move weights but also improve their flexibility and movable range of joint via joint exercises.
- Who provided study therapy: not reported
- How provided (face-to-face, internet, telephone, individual, in group): face-to-face
- Tailoring (if the intervention was intended to be personalised, titrated or adapted? What and how?): not reported
- Modification (intervention was modified during the course of the study?): not reported
- How well (if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity?): not reported
- How well? (if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned): not reported
- Material used: not reported
- Reporting of death and serious adverse events, including falls: not reported

Outcomes

Trunk function

- Outcome type: continuous outcome
- Scale: TIS 1.0
- Range: 0-23
- Direction: higher is better
- Data value: change from baseline

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Quote: "The participants were divided into two groups: a control group of 10 patients who underwent kinesiatrics and an experiment group of 10 patients who participated simultaneously in a core-stability-enhancing program and kinesiatrics (Table 1)."

Yu 2013 *(Continued)*

		Judgement comment: no details available in the manuscript
Allocation concealment (selection bias)	Unclear risk	Judgement comment: no details available in the manuscript
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not described if participants or personnel were blinded
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Judgement comment: no details available in the manuscript
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not clear from description in the manuscript
Selective reporting (reporting bias)	Unclear risk	Judgement comment: no study registration was available. Only significant results were presented.
Other bias	Unclear risk	Judgement comment: no details were available in the manuscript to rule out 'low risk' or 'high risk'

ABC: Activities-specific Balance Confidence Scale
ADIM: Abdominal drawing-in manoeuvre
ADL: Activities of daily living
AR: augmented reality
BBS: Berg Balance scale
BI: Barthel Index
BMI: Body Mass Index
BPM: Balance Performance Monitor
CG: control groep
CHD: coronary heart disease
CoP: center of pressure
CT: computed tomography
CVA: cerebrovascular accident
CVD: cerebrovascular disease
cm: centimeter
CMS: Core muscle strengthening
d: effect size index
DG: device group
EMG: Electromyograph
EO: external oblique muscles
ES: erector spinae muscles
FAC: Functional Ambulation Category
FES: Functional electrical stimulation
FICSIT-4: Frailty and Injuries Cooperative Studies of Intervention Technique
FIST: Function in sitting test
FMA-LE: Fugl-Meyer Assessment-Lower Extremity
FR: forward reach
FRT: functional reach in standing
H: haemorrhagic
Hz: Hertz
HMD: head-mounted device
I: ischaemic
I/H: ischemic/hemorrhagic
K-MBI: Korean version of Modified Barthel Index

L: left
LED: light-emitting diode
LCD: liquid-crystal display
L/R: left/right
MBI: Modified Barthel Index
MMSE: Mini Mental State Examination
MMSE-K: Mini Mental State Examination-Korean version
MoCA: Montreal Cognitive Assessment
MRI: magnetic resonance imaging
m/s: meter/second
N: number
n/a: not applicable
NDT: Neurodevelopmental treatment
NIHSS: National Institutes of Health Stroke Scale
NMES: neuromuscular electrical stimulation
NRS: numerical rating scale
PASS: Postural Assessment Scale for Stroke
PBS(s): pressure biofeedback system
PNF: proprioceptive neuromuscular facilitation
POMA: Performance-oriented Mobility Assessment
R: right
RCT: randomised controlled trial
RNLI: Reintegration to Normal Living Index
RS: rhythmic stabilisation
s: seconds
SD: standard deviation
SE: standard error
SET: sling exercise therapy
SF-36: 36-Item Short Form Survey
SIS-16: Stroke Impact Scale
SPVFTCT: smartphone-based visual feedback trunk control training
SR: stabilising reversal
STREAM: Stroke Rehabilitation Assessment of Movement
SVGA: Super VideoGraphics Array
TENS: transcutaneous electrical nerve stimulation
TIS: Trunk Impairment Scale
tNMES: trunk neuromuscular electrical stimulation
TrA: transversus abdominis
TRTT: task-related trunk training
TUG: Timed Up and Go Test
STE: selective-trunk exercise
VAS: visual analogue scale
VG: vibration group
VG: video game
VR: virtual reality
VRT: Virtual reality training
WBV: whole-body vibration
WSE: weight-shifting exercise
WST: weight-shifting training

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
ACTRN12608000457347	No trunk training (SMART arm training)
Awad 2015	Ineligible outcomes (peak muscle forces and torques, not the predefined outcomes)

Study	Reason for exclusion
Baek 2015	Ineligible outcomes (centre of path, travel speed & muscles thickness, not the predefined outcomes)
Barker 2008	No trunk training (training for upper extremities)
Bonan 2002	Training mostly in standing position
Bower 2014	Training in standing position
Brogardh 2012	Poster/conference abstract and practicing in standing position
Cekok 2016	Training in standing position
Chen 2008	Ineligible participant population (included healthy adults)
ChiCTR1800020170	Ineligible study design and no trunk training
Cho 2020	Ineligible comparator (trunk training in combination with kinesio is compared with trunk and placebo kinesio)
Cirstea 2007	Ineligible participant population (nondisabled participants were included) and training on upper extremities
CTRI/2018/01/011543	Trunk training was embedded in broader therapy (task-oriented training; circuit training for trunk and hip abductor)
Da Silva Ribeiro 2015	Training in standing position
Dell'Uomo 2017	No trunk training (scapulohumeral rehabilitation protocol/upper extremities training)
De Luca 2018	No trunk training
Dursun 1996	Ineligible study design (pre-post design, no RCT)
Foley 2004	Ineligible participant population (mixed population)
Fujino 2012	Ineligible outcomes (trunk control test had descriptive variables but not an outcome)
Glick 1997	Training in standing position
Guillén-Solà 2017	No trunk training
Ha 2020	Ineligible comparator (the effect of attentional concentration was evaluated)
Hancock 2017	Wrong study design (observational study)
Hirokawa 2013	Training in standing position
Hsieh 2019	Training in standing position
ISRCTN14335555	Training in standing position
ISRCTN20398227	Only trial registration was available; training was in standing position
Jung 2018	Training in standing position

Study	Reason for exclusion
Kal 2019	Training in standing position
Kim 2008	Training in standing position
Kim HY 2018	Ineligible study design (retrospective study, no RCT)
Kim JC 2018	Ineligible study design (a cross-over randomised controlled trial)
Koneva 2018	No trunk training
Kozol 2010	Trunk training was embedded in broader therapy
Krishna 2018	No trunk training
Kulkarni 2018	Training mostly in standing position
Lee 2017	No trunk training
Lee 2018b	No trunk training
Liaw 2020	No trunk training
Lin 1998	Training in standing position
Lobo 2022	Training in standing position
Marigold 2005	No trunk training
Mohapatra 2012	No trunk training
Muckel 2014	Ineligible comparator (both groups received weight shift; the intervention of interest was the different attention strategies)
NCT01304017	No trunk training (played games in pairs on one console then rotated to play another console with another partner)
NCT01371253	Ineligible participant population (only elderly Individuals, no stroke population)
NCT02565407	Ineligible study design (cross-over assignment and no trunk training)
NCT02654951	Only trial registration was available (randomized cross-over trial and no trunk training)
NCT02753322	Training in standing position
NCT03234426	Training mostly in standing position
NCT03602326	No trunk training
NCT03757026	Training in standing position
NCT04042961	Training in standing position
NCT04491279	Trunk training was embedded in broader therapy
Nyffeler 2017	No trunk training

Study	Reason for exclusion
Oh 2016	No trunk training
Oh 2017	Ineligible comparator
PACTR201801002927119	No trunk training
PACTR201810717634701	No trunk training (over-ground task-specific training activity which involved mobility-related task-specific exercises)
Park 2014	Ineligible outcomes (outcome on sway area and length)
Park 2017	Ineligible outcomes (only pulmonary function)
Petrofsky 2005	Ineligible study design (no RCT and other populations included: spinal cord injury and multiple sclerosis)
Rajaratnam 2011	Training in standing position
Ramachandran 2016	Training in standing position
Rao 2013	Ineligible participant population (osteoarthritis was also included in the analysis)
Rasheeda 2017	Ineligible outcomes (weight-bearing on a weighing scale)
Sánchez-Sánchez 2018	Trunk training was embedded in broader therapy
Schmid 2015	No trunk training (a standardised and progressive protocol was developed and included modified yoga postures, breathing, and relaxation in sitting, standing, and supine positions)
Shah 2018	Ineligible study design (not a randomised controlled trial)
Shin JW 2016	Training in standing position
Shumway-Cook 1988	Ineligible participant population (also included healthy population)
Singh 2002	Training in standing position
Song 2015	Trunk training was embedded in broader therapy
Sorinola 2018	Ineligible study design (feasibility study, pre-post design)
Starke 2002	Ineligible participant population (skull-brain-trauma: e.g. apoplexia, brain trauma, intracerebral haemorrhage)
Subramanian 2007	Ineligible participant population (stroke and healthy participants)
Summa 2015	Ineligible participant population (the study involved three stroke survivors and one with hemiplegia caused by a traumatic brain injury)
Sung 2013	Ineligible outcomes (temporospatial gait assessed using OptoGait and trunk muscles (abdominis and erector spinae on affected side) activity evaluated using surface electromyography during sit-to-stand and gait)
Taylor-Pilliae 2014	No trunk training

Study	Reason for exclusion
Teixeira 1998	Ineligible study design (a single group pre- and post-test group design)
Thielman 2003	No trunk training (training for upper extremities)
Thielman 2013	No intervention, only follow-up measurement
U1111-1239-3846	No trunk training
Ustinova 2002	No trunk training (the participants stood on a force platform)
Valdés 2018	Ineligible study design (a randomised cross-over trial)
Walker 2000	No trunk training (training stance symmetry)
Wu 2001	Ineligible study design (cross-sectional)
Yavuzer 2006	No trunk training (balance training in standing position but no trunk training)
Yelnik 2008	Training mostly in standing position
Yoo 2014	Ineligible outcomes (muscle thickness)
Zheng 2021	No trunk training

SMART: Specific, Measurable, Achievable, Realistic, and Timely

Characteristics of studies awaiting classification *[ordered by study ID]*

Deshmukh 2018

Methods	RCT
Participants	Not known
Interventions	Not known
Outcomes	Not known
Notes	We contacted the authors by mail but have not yet received a response.

Kim 2009

Methods	RCT
Participants	Inclusion criteria: acute and subacute hemiparetic stroke
Interventions	Both groups received the same physical therapy for 3 weeks. Intervention: electrostimulation group received additional electrical stimulation over the posterior back muscles for 30 minutes a day, 5 days per week for 3 weeks. Comparator: standard care

Kim 2009 *(Continued)*

Outcomes	Primary outcome measures: Korean version of Berg Balance Scale, total score of Postural Assessment Scale for Stroke patients, trunk control subscale of Postural Assessment Scale for Stroke patients, Trunk Control Test, Korean version of modified Barthel Index, and the Motricity Index Secondary outcome measures: unknown
Notes	We contacted the authors by mail but have not yet received a response.

Liao 2006

Methods	RCT
Participants	Not known
Interventions	Intervention: 30 minutes of high-intensity trunk control training plus 15 minutes of low-intensity conventional stroke rehabilitation (45 minutes, once per day for 5 days) Comparator: 45 minutes of low-intensity conventional stroke rehabilitation, once per day for 5 days
Outcomes	Primary outcome measures: trunk function by the Trunk Impairment Scale Secondary outcome measures: balance, mobility and functional independence, which were assessed by the Brunel Balance Assessment, the Modified Rivermead Mobility Index, and the modified Barthel Index
Notes	We contacted the author through ResearchGate but have not yet received a response.

Shen 2013

Methods	RCT
Participants	Not known
Interventions	All the stroke patients got the same regulation rehabilitation treatments. Programmes of both groups were 30 minutes per day, 5 days per week for 4 weeks. Intervention: core-stability training in addition to standard care Comparator: only standard care
Outcomes	Primary outcome measures: Berg Balance Scale, Holden Walking Function Rating Scale, and footprint analysis were used to evaluate balance function and walking ability. Secondary outcome measures: none known
Notes	We contacted the author through ResearchGate but have not yet received a response.

Wang 2016

Methods	RCT
Participants	Inclusion criteria: stroke patients with Pusher syndrome

Wang 2016 *(Continued)*

Interventions	Participants were divided into 3 groups: visual feedback training (A), core-stability training (B), visual feedback and core-stability training (C)
Outcomes	Primary outcome measures: the scale for contralateral pushing for severity of Pusher syndrome, the Berg Balance Scale for balance performance, and the Barthel Index for activities of daily living
Notes	

Yan 2017

Methods	RCT
Participants	Not known
Interventions	Both groups received other conventional rehabilitation treatment. Intervention: trunk control training using suspension technology Comparator: traditional trunk control training
Outcomes	Primary outcome measures: trunk function by Trunk Control Test, walking ability by the Functional Ambulation Category Scale, balance by the Berg Balance Scale and 10-Meter Maximum Walking Speed
Notes	We contacted the authors by mail but have not yet received a response.

Yoon 2020

Methods	Randomised controlled trial
Participants	Not known
Interventions	Both groups received therapy for 30 minutes each per day, 3 days a week for 4 weeks. Intervention: dynamic neuromuscular stabilisation (16 participants) Comparator: neurodevelopmental treatment (15 participants) for 30 minutes each per day, 3 days a week for 4 weeks
Outcomes	Primary outcome measures: diaphragm movement and abdominal muscle thickness were determined using ultrasonography. The Trunk Impairment Scale and Berg Balance Scale were used to measure postural control. The Functional Ambulation Category was used to evaluate gait ability.
Notes	We contacted the author through ResearchGate but have not yet received a response.

RCT: randomised controlled trial

Characteristics of ongoing studies *[ordered by study ID]*

ACTRN12617000452392

Study name	Core muscles strengthening for balance and gait performance in individuals with chronic stroke

ACTRN12617000452392 *(Continued)*

Methods	RCT
Participants	Inclusion criteria • Stroke > 6 months • Trunk impairment scale < 23 • Can walk > 15 metres independently with or without assistive device • Mini Mental State Examination > 24 • Brunnstrome stage > IV (lower extremity) Exclusion criteria • Have any musculoskeletal problem • Visual and language problems
Interventions	Intervention: participants will receive 6 weeks of core muscle strengthening Comparator: standard care
Outcomes	Primary outcomes: limits of stability by SMART Balance Master, spatial-temporal gait parameters by GAITRite system, trunk muscle strength by hand-held dynamometer
Starting date	10 November 2016
Contact information	Prof Wang, Ray-Yau rywang@ym.edu.tw
Notes	We contacted the authors by mail but have not yet received a response.

CTRI201802011894

Study name	Effect of proprioceptive neuromuscular facilitation and truncal exercises on trunk control and dynamic sitting balance in post stroke subjects
Methods	RCT
Participants	Inclusion criteria: 1. First onset of acute stroke patients, diagnosis confirmed by neurologist or physician and further referred to department of physiotherapy for stroke rehabilitation 2. Subjects with supratentorial lesion 3. MMSE score > 24 4. Trunk Control Test score equal to 100 Exclusion criteria: 1. Subjects with cerebellar and brainstem stroke 2. Subjects having other neurological disorders eg. Parkinson's disease 3.Subjects having general musculoskeletal conditions which is limiting subjects performance in the outcome measure/ treatment protocol 4. Subjects with hemi-neglect, pushers syndrome, severe visual field defects and somato-sensory deficit
Interventions	Intervention 1: Propriceptive neuromascular facilitation for trunk control: proprioceptive neuromascular facilitation exercises includes diagonal pattern procedure and technique to stimulate proprioceptive sensation either to inhibit or to simulate specific muscle groups. Intervention 2: Proprioceptive neuromuscular facilitation (PNF): proprioceptive neuromuscular facilitation (PNF) approach includes specific diagonal pattern, procedure and techniques to stimulate proprioceptive sensation either to inhibit or to stimulate specific muscle groups. Control Intervention 1: Truncal excercises: exercises designed to improve trunk control by using stable and unstable surface

CTRI201802011894 *(Continued)*

Outcomes	Trunk Impairment Scale Function in sitting balance test to measure dynamic sitting balance Functional independence measure to measure the activity of daily living Patient global impression of change scale
Starting date	
Contact information	
Notes	

CTRI201810016074

Study name	Novel biofeedback on trunk and balance in acute hemiplegic patients
Methods	Not known
Participants	Not known
Interventions	Not known
Outcomes	Not known
Starting date	Not known
Contact information	Not known
Notes	None

Karthikbabu 2018b

Study name	Can core-stability training improve trunk strength and balance self-confidence in chronic stroke? 12 months follow-up
Methods	RCT
Participants	Not known
Interventions	Not known
Outcomes	Not known
Starting date	Not known
Contact information	Not known
Notes	None

NCT03503617

Study name	RehabTouch home therapy for stroke patients
Methods	RCT
Participants	Inclusion criteria • Age: 18 to 85 years old • Upper extremity weakness measured by a clinical scale • Absence of moderate-to-severe pain on affected upper extremity • Able to understand the instructions to operate RehabTouch Exclusion criteria • Concurrent severe medical problems, visual deficits, severe neglect or apraxia • Enrolment in other therapy studies
Interventions	Intervention: participants will perform targeted movement exercises by interacting with the RehabTouch pucks, as described and monitored on a computer. Participants will be asked to exercise at least 3 hours per week for 3 consecutive weeks. Comparator: conventional tabletop exercise programme: a traditional exercise programme described in a booklet similar to what is typically provided to stroke patients upon their discharge from the hospital. Participants will be asked to perform these exercises at least 3 hours per week for 3 consecutive weeks.
Outcomes	Primary outcomes: change in Fugl-Meyer Assessment Secondary outcomes: Action Research Activity Test (ARAT), standing balance by Berg Balance Test, trunk function by Trunk Impairment Scale, lower extremity Fugl-Meyer Assessment, Timed Up and Go, 10-Meter Walk Test, Motor Activity Log, Visual Analogue Scale, spasticity by the Modified Ashworth Scale
Starting date	1 November 2018
Contact information	Daniel Zondervan: dzondervan@flintrehab.com
Notes	

NCT03811106

Study name	Neuromuscular electrical stimulation (NMES) in stroke-diagnosed individuals
Methods	RCT
Participants	Inclusion criteria • Having a chart of hemiplegia or hemiparesis due to the first cerebrovascular accident • At least 3 months after cerebrovascular accident • Mini Mental State Examination value ≥ 15 • Age between 30 to 80 years • Back extensor muscle spasticity value < 4 according to modified Ashworth Scale Exclusion criteria • Ataxia, dystonia, dyskinesia • The presence of lower motor neuron or peripheral nerve lesion

NCT03811106 *(Continued)*

	• Degraded deep sensory capabilities • Detection disorder and dementia • Skin and peripheral circulatory disorder • History of cerebrovascular accident, bilateral hemiplegia
Interventions	Intervention: NMES will be applied to the back muscles with the Chattanooga Intelect advanced device. In addition, conventional physiotherapy and rehabilitation applications will be made. Comparator: conventional physiotherapy and rehabilitation practices will be carried out.
Outcomes	Primary outcomes: functional capacity and mobility, standing balance by the Brunnel Balance scale, motor function by Stroke Rehabilitation Assessment of Movement, functional capacity by Functional Ambulation Classficiation, balance states by the Adapated Patient Evaluation and Conference System, postural control by Postural Assessment Scale for Stroke, quality of life by Short Form-36 (SF-36), cognitive functions by the Mini Mental State Examination Test Secondary outcomes: none
Starting date	4 March 2019
Contact information	No contact details were provided.
Notes	

NCT03975985

Study name	The effectiveness of core-stability exercises
Methods	RCT
Participants	**Inclusion criteria:** first-ever stroke and less than 30 days (diagnostic criteria according to the World Health Organization definition; corresponding to International Classification of Diseases (ICD)-9 code 434) whether cortical or subcortical, and ischaemic or haemorrhagic; unilateral localisation of the stroke verified by computed tomography; ≥ 18 years old; ability to understand and execute simple instructions; Spanish version of Trunk Impairment Scale 2.0 less than10 points; National Institutes of Health Stroke Scale score > 4 points **Exclusion criteria:** Rankin scale ≥ 2 points before stroke; orthopaedic and other neurological disorders that hamper sitting balance; relevant psychiatric disorders that may prevent individual from following instructions; other treatments that could influence the effects of the interventions; contraindication to physical activity (e.g. heart failure); using cardiac pacemakers; moderate-to-severe cognitive impairments as indicated by Mini Mental State Examinsation test score < 24 points; people with haemorrhagic stroke who have undergone surgery
Interventions	Intervention: core-stability exercises (CSE) with transcutaneous electrical nerve stimulation and conventional therapy (CP) for 5 weeks. CSE are exercises focused on trunk muscle strengthening, proprioception, selective movements of the trunk and pelvis muscle, and co-ordination, and will be carried out in supine, sitting on a stable surface and sitting on an unstable surface (physio ball). The exercise involves changes in the position of the body without resistance, aiming to improve strength, endurance, proprioception and co-ordination. Transcutaneous electrical nerve stimulation (TENS): half of the participants assigned to CSE will also receive TENS (high frequency TENS 100 Hz; 0.2 ms pulse width), administered via TENS stimulator with two disposable 0.9 mm diameter electrodes placed on the skin over the lumbar erector spinae (3 cm lateral to the L3 and L5 spinous process).

NCT03975985 *(Continued)*

	The common feature of conventional therapy is that it consists of a management by the physiotherapist. The CP may consist of a variety (or combination) of multiple components such as tone normalisation, exercises to maintain range of motion, passive mobilisation of hemiparetic side, postural control, gait re-education to walking/standing between parallel bars or with a therapist, rehabilitation of the activities of daily living, etc. Comparator: core-stability exercises (CSE) with conventional physiotherapy for 5 weeks
Outcomes	Primary outcomes: dynamic sitting balance and trunk control by Spanish-Trunk Impairment Scale 2.0 (S-TIS 2.0), stepping by the Brunel Balance Assessment section 3 Secondary outcomes: sitting balance by the Spanish Function in Sitting Test, gait speed by the G-walk (accelerometer, BTS Bioengineering), standing balance by the Berg Balance Scale, risk of falling by Spanish Postural Assessment Scale for Stroke, activities of daily living by modified Barthel Index, spasticity by the Modified Ashworth Scale, rate of falls, health-related quality of life by the EuroQuol - 5 dimension
Starting date	15 January 2020
Contact information	Rosa Cabanas-Valdés; Rosacabanas@uic.es +34 93 504 20 00Rosa Cabanas-Valdés
Notes	

NCT03991390

Study name	Effectiveness of balance exercise programme for stroke patients with Pusher Syndrome
Methods	RCT
Participants	Inclusion criteria • People ≥ 18 years admitted to an intermediate care unit after suffering from subacute stroke, for functional recovery • Diagnosis of ischaemic or haemorrhagic stroke confirmed by magnetic resonance imaging or computed tomography scan • Pusher syndrome identified by the Scale for Contraversive Pushing with a score of ≥ 2 and by Burke Lateropulsion Scale with a value of ≥ 3 Exclusion criteria • People with severe previous functional dependence (Barthel Index ≤ 60) • People diagnosed with dementia (Global Deterioration Scale-4) or previous severe cognitive impairment • People diagnosed with delirium • People diagnosed with Wernicke's aphasia • People with a previous severe visual deficit that prevents them from continuing activity (retinopathy, cataracts, etc.) • People with a history of other causes of balance impairment • People with orthopaedic conditions that impede the performance of the proposed rehabilitation treatment • People enrolled in other research studies
Interventions	Intervention: this arm consists of 5 sessions per week, 60 minutes each. One session consists of 30 minutes of conventional physiotherapy and 30 minutes of core-stability exercises and laser visual feedback exercises, on alternate days. All sessions will be performed by the same physiotherapist.

NCT03991390 *(Continued)*

	Comparator: this arm consists of 5 sessions per week, 60 minutes each comprising usual physiotherapy treatment. All sessions will be performed by the same physiotherapist.
Outcomes	Primary outcomes: contraversive pushing, lateropulsion by the Burke Lateropulsion Scale, balance by the Spanish Postural Assessment Scale for Stroke patients Secondary outcomes: quality of life by the Newcastle Stroke-Specific Quality of Life Measure (NEWSQOL)
Starting date	20 November 2018
Contact information	Parc Sanitari Pere Virgili Abarrios@perevirgili.cat Universitat Internacional de Catalunya Phone number: 616243397
Notes	

NCT04440748

Study name	Feasibility study and pilot RCT into the use of a novel technology to train sitting balance and trunk control
Methods	RCT
Participants	Inclusion criteria • Diagnosis of a recent stroke; a previous stroke is allowed when full recovery was reached • Impairment of trunk function, meaning a Trunk Impairment Scale between 2 and ≤ 19 points • Able to sit independently for 2 minutes • Being admitted as an inpatient to the Rehabilitation Clinic Valens • Older than 18 years • Language and cognitive functions on such a level that participants are able to understand and execute instructions that are needed to complete the therapy Exclusion criteria • Not able to give informed consent • Unable to understand and execute instructions • Other neurological diseases of the central nervous system, such as multiple sclerosis, Parkinson's disease, etc. • Comorbidities that influence trunk function and sitting balance, such as other musculoskeletal or other neurological diseases • Pregnancy
Interventions	Intervention: participants in the experimental group will perform additional high-intensity therapy on the T-Chair 2.0, which is a newly developed prototype to train trunk control and sitting balance. They will do this therapy in addition to their normal rehabilitation programme. Comparator: participants in the control group will execute their normal rehabilitation programme.
Outcomes	Primary outcomes: feasibility parameters

NCT04440748 *(Continued)*	
	Secondary outcomes: trunk function by Trunk Impairment Scale, muscular strength of the lower extremities and trunk muscles, Fugl-Meyer Assessment of lower extremities, sitting balance by Limits of Stability, walking capacity by Functional Ambulation Categories, Timed Up and Go, cognition by the Montreal Cognitive Assessment, unilateral spatial neglect by the Star Cancellation Tests
Starting date	1 September 2020
Contact information	jan.kool@kliniken-valens.ch evelien.wiskerke@kuleuven.be
Notes	

ARAT: Action Research Arm test
CP: conventional therapy
CSE: core-stability exercises
ICD: International Classification of Diseases
NEWSQOL: Newcastle Stroke-Specific Quality of Life Measure
NMES: neuromuscular electrical stimulation
PNF: Proprioceptive neuromuscular facilitation
RCT: randomised controlled trial
SF-36: 36-Item Short Form Survey
SMART: Specific, Measurable, Achievable, Realistic, and Timely
S-TIS: Spanish-Trunk Impairment Scale 2.0
TENS: transcutaneous electrical nerve stimulation

DATA AND ANALYSES

Comparison 1. Experimental training vs control group (Non-dose-matched therapy in control group)

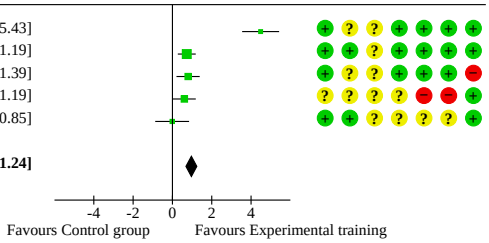
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1.1 Activities of daily living	5	283	Std. Mean Difference (IV, Fixed, 95% CI)	0.96 [0.69, 1.24]
1.2 Trunk function	14	466	Std. Mean Difference (IV, Fixed, 95% CI)	1.49 [1.26, 1.71]
1.3 Arm-hand function	2	74	Std. Mean Difference (IV, Fixed, 95% CI)	0.67 [0.19, 1.15]
1.4 Arm-hand activity	1	30	Std. Mean Difference (IV, Fixed, 95% CI)	0.84 [0.09, 1.59]
1.5 Standing balance	11	410	Std. Mean Difference (IV, Fixed, 95% CI)	0.57 [0.35, 0.79]
1.6 Leg function	1	64	Std. Mean Difference (IV, Fixed, 95% CI)	1.10 [0.57, 1.63]
1.7 Walking ability	11	383	Std. Mean Difference (IV, Fixed, 95% CI)	0.73 [0.52, 0.94]
1.8 Quality of life	2	108	Std. Mean Difference (IV, Fixed, 95% CI)	0.50 [0.11, 0.89]
1.9 Death and serious adverse events, including falls	6	201	Peto Odds Ratio (Peto, Fixed, 95% CI)	7.94 [0.16, 400.89]
1.10 Barthel Index	4	209	Mean Difference (IV, Fixed, 95% CI)	11.58 [6.80, 16.35]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1.11 Trunk Impairment Scale version 1.0	10	280	Mean Difference (IV, Fixed, 95% CI)	2.88 [2.72, 3.04]
1.12 Modified Functional Reach test	3	82	Mean Difference (IV, Fixed, 95% CI)	2.17 [1.03, 3.30]
1.13 Berg Balance Scale	7	270	Mean Difference (IV, Fixed, 95% CI)	5.75 [5.06, 6.43]
1.14 Timed Up and Go Test	7	170	Mean Difference (IV, Fixed, 95% CI)	-0.46 [-0.75, -0.17]
1.15 Tinetti Gait	3	146	Mean Difference (IV, Fixed, 95% CI)	1.90 [0.96, 2.84]
1.16 Ten-Meter Walk Test	2	49	Mean Difference (IV, Fixed, 95% CI)	0.06 [-0.01, 0.13]

Analysis 1.1. Comparison 1: Experimental training vs control group (Non-dose-matched therapy in control group), Outcome 1: Activities of daily living

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Std. Mean Difference IV, Fixed, 95% CI
Büyükavcı 2016	26.9	2.19	32	18.62	1.36	32	8.6%	4.49 [3.55 , 5.43]
Cabanas-Valdés 2016	36.5	18.81	40	23.33	16.87	39	36.6%	0.73 [0.27 , 1.19]
Cano-Mañas 2020	20.87	13.12	23	11	11.27	25	21.9%	0.80 [0.21 , 1.39]
Merkert 2011	27.2	22.3	25	14.1	20	23	22.6%	0.61 [0.03 , 1.19]
Mudie 2002	43.61	353.5	38	48.4	12.67	6	10.3%	-0.01 [-0.88 , 0.85]
Total (95% CI)			**158**			**125**	**100.0%**	**0.96 [0.69 , 1.24]**

Heterogeneity: Chi² = 61.68, df = 4 (P < 0.00001); I² = 94%
Test for overall effect: Z = 6.84 (P < 0.00001)
Test for subgroup differences: Not applicable

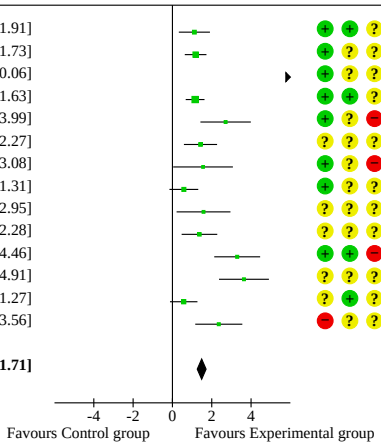


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 1.2. Comparison 1: Experimental training vs control group (Non-dose-matched therapy in control group), Outcome 2: Trunk function

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Std. Mean Difference IV, Fixed, 95% CI	Risk of Bias A B C D E F G
An 2017	2.27	1.75	15	0.71	0.73	14	8.1%	1.12 [0.33 , 1.91]	+ + ? + + − +
Bilek 2020	8.73	4.51	30	3.27	4.63	30	16.6%	1.18 [0.63 , 1.73]	+ ? ? + ? ? +
Büyükavcı 2016	5.9	0.45	32	2.25	0.4	32	2.0%	8.47 [6.88 , 10.06]	+ ? ? + + + +
Cabanas-Valdés 2016	5.88	3.48	40	2.48	2.2	39	22.1%	1.15 [0.68 , 1.63]	+ + ? + + + +
Kumar 2011	6.69	1.28	10	3.13	1.24	10	3.1%	2.71 [1.42 , 3.99]	+ ? − + − ? +
Lee 2012	3.7	2.3	14	0.9	1.4	14	7.1%	1.43 [0.58 , 2.27]	? ? ? ? + ? +
Lee 2016a	2.8	1.3	5	1	0.7	5	2.2%	1.56 [0.04 , 3.08]	+ ? − ? − − +
Lee MM 2018	5.14	1.66	15	4.1	1.82	15	9.4%	0.58 [-0.15 , 1.31]	+ ? ? + + + +
Seo 2012	5.17	2.75	6	1.5	1.27	6	2.7%	1.58 [0.21 , 2.95]	? ? ? ? − + ?
Shin 2016	3.08	2.71	12	0.08	1.24	12	6.1%	1.37 [0.47 , 2.28]	? ? ? + + ? +
Thijs 2021	7.07	1.69	14	0.33	2.23	15	3.7%	3.29 [2.13 , 4.46]	+ + − + ? ? ?
Varshney 2019	4.29	0.41	13	2.87	0.35	15	3.1%	3.64 [2.37 , 4.91]	? ? ? ? − ? ?
Verheyden 2009	4.82	2.12	17	3.31	2.97	16	10.3%	0.57 [-0.12 , 1.27]	? + ? + + ? +
Yu 2013	4	1.55	10	0.5	1.28	10	3.5%	2.36 [1.16 , 3.56]	− ? ? ? ? ? ?
Total (95% CI)			**233**			**233**	**100.0%**	**1.49 [1.26 , 1.71]**	

Heterogeneity: Chi² = 116.14, df = 13 (P < 0.00001); I² = 89%
Test for overall effect: Z = 12.98 (P < 0.00001)
Test for subgroup differences: Not applicable

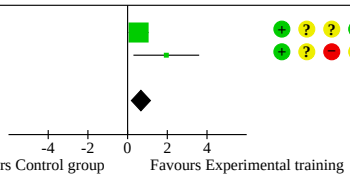


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 1.3. Comparison 1: Experimental training vs control group (Non-dose-matched therapy in control group), Outcome 3: Arm-hand function

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Std. Mean Difference IV, Fixed, 95% CI	Risk of Bias A B C D E F G
Büyükavcı 2016	1.6	0.56	32	1.2	0.84	32	91.6%	0.55 [0.05 , 1.05]	+ ? ? + + + +
Lee 2016a	4.4	1.1	5	1.8	1.3	5	8.4%	1.95 [0.29 , 3.61]	+ ? − ? − − +
Total (95% CI)			**37**			**37**	**100.0%**	**0.67 [0.19 , 1.15]**	

Heterogeneity: Chi² = 2.50, df = 1 (P = 0.11); I² = 60%
Test for overall effect: Z = 2.74 (P = 0.006)
Test for subgroup differences: Not applicable

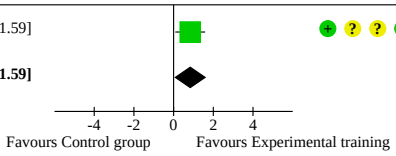


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 1.4. Comparison 1: Experimental training vs control group (Non-dose-matched therapy in control group), Outcome 4: Arm-hand activity

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Std. Mean Difference IV, Fixed, 95% CI	Risk of Bias A B C D E F G
Lee MM 2018	2.47	1.36	15	1.47	0.92	15	100.0%	0.84 [0.09 , 1.59]	+ ? ? + + + +
Total (95% CI)			**15**			**15**	**100.0%**	**0.84 [0.09 , 1.59]**	

Heterogeneity: Not applicable
Test for overall effect: Z = 2.19 (P = 0.03)
Test for subgroup differences: Not applicable

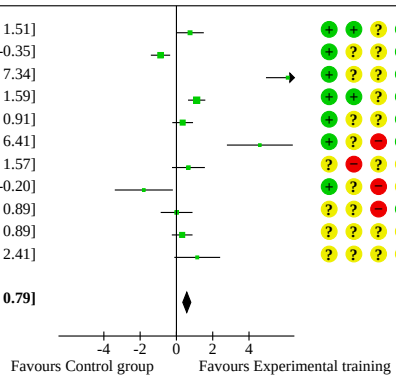


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 1.5. Comparison 1: Experimental training vs control group (Non-dose-matched therapy in control group), Outcome 5: Standing balance

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Std. Mean Difference IV, Fixed, 95% CI	Risk of Bias A B C D E F G
An 2017	3.07	2.66	15	1.36	1.6	14	8.6%	0.75 [-0.01 , 1.51]	+ + ? + + − +
Bilek 2020	3.07	2.97	30	5.54	2.57	30	17.4%	-0.88 [-1.41 , -0.35]	+ ? ? + ? ? +
Büyükavcı 2016	24.41	2.71	32	11.09	1.36	32	3.4%	6.14 [4.94 , 7.34]	+ ? ? + + + +
Cabanas-Valdés 2016	23.02	15.95	40	8.48	8.74	39	21.7%	1.12 [0.64 , 1.59]	+ + ? + + + +
Cano-Mañas 2020	3	2.4	23	2.16	2.41	25	15.1%	0.34 [-0.23 , 0.91]	+ ? ? + + + −
Kumar 2011	7.2	0.09	10	4.4	0.82	10	1.5%	4.60 [2.78 , 6.41]	+ ? − + − ? +
Lee 2014b	4.1	3.4	10	1.7	3.55	10	6.0%	0.66 [-0.24 , 1.57]	? − ? ? + + +
Lee 2016a	0.4	0.9	5	2.4	1.1	5	1.9%	-1.80 [-3.40 , -0.20]	+ ? − ? − − +
Lee 2020b	2.38	8.2	10	2.29	9.98	10	6.4%	0.01 [-0.87 , 0.89]	? ? − + + + +
Merkert 2011	12.2	10.7	25	9.1	8.3	23	15.1%	0.32 [-0.25 , 0.89]	? ? ? ? − − +
Seo 2012	5.85	2.59	6	1.81	3.8	6	3.1%	1.15 [-0.12 , 2.41]	? ? ? ? − + ?
Total (95% CI)			**206**			**204**	**100.0%**	**0.57 [0.35 , 0.79]**	

Heterogeneity: Chi² = 147.28, df = 10 (P < 0.00001); I² = 93%
Test for overall effect: Z = 5.05 (P < 0.00001)
Test for subgroup differences: Not applicable

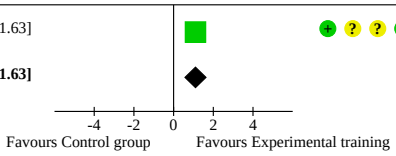


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 1.6. Comparison 1: Experimental training vs control group (Non-dose-matched therapy in control group), Outcome 6: Leg function

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Std. Mean Difference IV, Fixed, 95% CI	Risk of Bias A B C D E F G
Büyükavcı 2016	1.4	0.57	32	0.7	0.68	32	100.0%	1.10 [0.57 , 1.63]	+ ? ? + + + +
Total (95% CI)			**32**			**32**	**100.0%**	**1.10 [0.57 , 1.63]**	

Heterogeneity: Not applicable
Test for overall effect: Z = 4.09 (P < 0.0001)
Test for subgroup differences: Not applicable

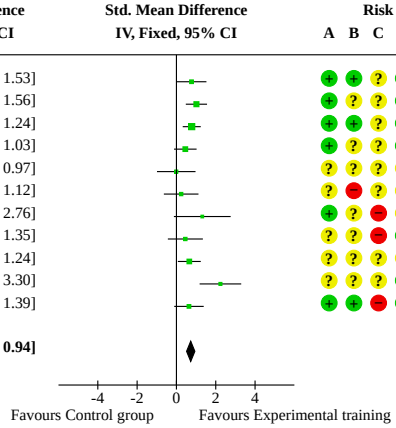


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 1.7. Comparison 1: Experimental training vs control group (Non-dose-matched therapy in control group), Outcome 7: Walking ability

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Std. Mean Difference IV, Fixed, 95% CI	Risk of Bias A B C D E F G
An 2017	4.11	2.24	15	2.01	3.05	14	7.7%	0.77 [0.01 , 1.53]	+ + ? + + − +
Bilek 2020	1.3	0.79	30	0.4	0.95	30	15.1%	1.02 [0.48 , 1.56]	+ ? ? + ? ? +
Cabanas-Valdés 2016	5.77	4.43	40	2.62	3.52	39	21.0%	0.78 [0.32 , 1.24]	+ + ? + + + +
Cano-Mañas 2020	0.53	0.55	23	0.28	0.54	25	13.4%	0.45 [-0.12 , 1.03]	+ ? ? + + + −
Chung 2013	5.42	5.61	8	5.48	6.8	8	4.6%	-0.01 [-0.99 , 0.97]	? ? ? ? − + +
Lee 2014b	4.7	6.19	10	2.9	8.03	10	5.7%	0.24 [-0.64 , 1.12]	? − ? ? + + +
Lee 2016a	1.43	0.5	5	-0.1	1.4	5	2.1%	1.31 [-0.13 , 2.76]	+ ? − ? − − +
Lee 2020b	2.62	3.14	10	1.35	2.11	10	5.6%	0.45 [-0.44 , 1.35]	? ? − + + + +
Merkert 2011	13.9	13.2	25	6.8	6.9	23	13.0%	0.66 [0.07 , 1.24]	? ? ? ? − − +
Shin 2016	9.7	4.46	12	2.16	1.13	12	3.9%	2.24 [1.18 , 3.30]	? ? ? + + ? +
Thijs 2021	0.16	0.11	14	0.1	0.07	15	7.9%	0.64 [-0.11 , 1.39]	+ + − + ? ? ?
Total (95% CI)			**192**			**191**	**100.0%**	**0.73 [0.52 , 0.94]**	

Heterogeneity: Chi² = 14.33, df = 10 (P = 0.16); I² = 30%
Test for overall effect: Z = 6.78 (P < 0.00001)
Test for subgroup differences: Not applicable

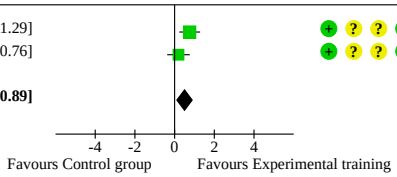


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 1.8. Comparison 1: Experimental training vs control group (Non-dose-matched therapy in control group), Outcome 8: Quality of life

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Std. Mean Difference IV, Fixed, 95% CI
Bilek 2020	81.48	40.45	30	51.98	36.03	30	53.9%	0.76 [0.23 , 1.29]
Cano-Mañas 2020	26.95	63.99	23	18	11.8	25	46.1%	0.20 [-0.37 , 0.76]
Total (95% CI)			**53**			**55**	**100.0%**	**0.50 [0.11 , 0.89]**

Heterogeneity: Chi² = 2.05, df = 1 (P = 0.15); I² = 51%
Test for overall effect: Z = 2.54 (P = 0.01)
Test for subgroup differences: Not applicable

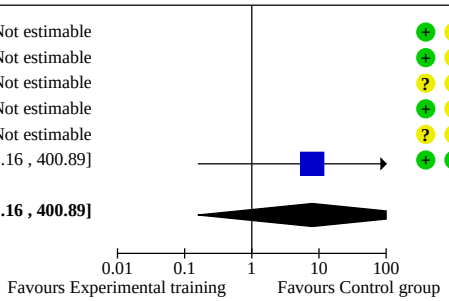


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 1.9. Comparison 1: Experimental training vs control group (Non-dose-matched therapy in control group), Outcome 9: Death and serious adverse events, including falls

Study or Subgroup	Experimental Events	Total	Control Events	Total	Weight	Peto Odds Ratio Peto, Fixed, 95% CI
Cano-Mañas 2020	0	23	0	25		Not estimable
Lee 2016a	0	25	0	25		Not estimable
Lee 2020b	0	10	0	10		Not estimable
Lee MM 2018	0	15	0	15		Not estimable
Shin 2016	0	12	0	12		Not estimable
Thijs 2021	1	14	0	15	100.0%	7.94 [0.16 , 400.89]
Total (95% CI)		**99**		**102**	**100.0%**	**7.94 [0.16 , 400.89]**
Total events:	1		0			

Heterogeneity: Not applicable
Test for overall effect: Z = 1.04 (P = 0.30)
Test for subgroup differences: Not applicable

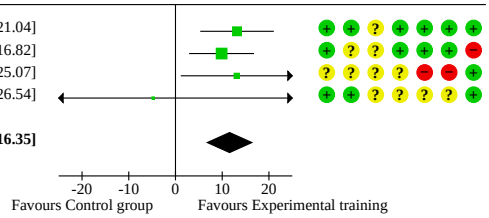


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 1.10. Comparison 1: Experimental training vs control group (Non-dose-matched therapy in control group), Outcome 10: Barthel Index

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Mean Difference IV, Fixed, 95% CI	Risk of Bias A B C D E F G
Cabanas-Valdés 2016	36.5	18.81	40	23.33	16.87	39	36.7%	13.17 [5.30 , 21.04]	+ + ? + + + +
Cano-Mañas 2020	20.87	13.12	23	11	11.27	25	47.2%	9.87 [2.92 , 16.82]	+ ? ? + + + −
Merkert 2011	27.2	22.3	25	14.1	20	23	15.9%	13.10 [1.13 , 25.07]	? ? ? ? − − +
Mudie 2002	43.61	353.5	28	48.4	12.67	6	0.1%	-4.79 [-136.12 , 126.54]	+ + ? ? ? ? +
Total (95% CI)			**116**			**93**	**100.0%**	**11.58 [6.80 , 16.35]**	

Heterogeneity: Chi² = 0.51, df = 3 (P = 0.92); I² = 0%
Test for overall effect: Z = 4.75 (P < 0.00001)
Test for subgroup differences: Not applicable

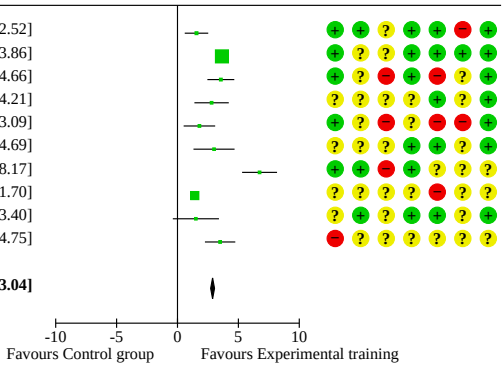


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 1.11. Comparison 1: Experimental training vs control group (Non-dose-matched therapy in control group), Outcome 11: Trunk Impairment Scale version 1.0

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Mean Difference IV, Fixed, 95% CI	Risk of Bias A B C D E F G
An 2017	2.27	1.75	15	0.71	0.73	14	2.7%	1.56 [0.60 , 2.52]	+ + ? + + − +
Büyükavcı 2016	5.9	0.45	32	2.25	0.4	32	57.3%	3.65 [3.44 , 3.86]	+ ? ? + + + +
Kumar 2011	6.69	1.28	10	3.13	1.24	10	2.0%	3.56 [2.46 , 4.66]	+ ? − + − ? +
Lee 2012	3.7	2.3	14	0.9	1.4	14	1.3%	2.80 [1.39 , 4.21]	? ? ? ? + ? +
Lee 2016a	2.8	1.3	5	1	0.7	5	1.5%	1.80 [0.51 , 3.09]	+ ? − ? − − +
Shin 2016	3.08	2.71	12	0.08	1.24	12	0.9%	3.00 [1.31 , 4.69]	? ? ? + + ? +
Thijs 2021	7.07	1.69	14	0.33	2.23	15	1.2%	6.74 [5.31 , 8.17]	+ + − + ? ? ?
Varshney 2019	4.29	0.41	13	2.87	0.35	15	30.8%	1.42 [1.14 , 1.70]	? ? ? ? − ? ?
Verheyden 2009	4.82	2.12	13	3.31	2.97	15	0.7%	1.51 [-0.38 , 3.40]	? + ? + + ? +
Yu 2013	4	1.55	10	0.5	1.28	10	1.6%	3.50 [2.25 , 4.75]	− ? ? ? ? ? ?
Total (95% CI)			**138**			**142**	**100.0%**	**2.88 [2.72 , 3.04]**	

Heterogeneity: Chi² = 195.51, df = 9 (P < 0.00001); I² = 95%
Test for overall effect: Z = 35.75 (P < 0.00001)
Test for subgroup differences: Not applicable

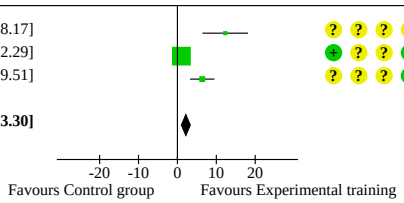


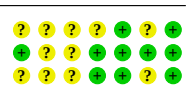
Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 1.12. Comparison 1: Experimental training vs control group (Non-dose-matched therapy in control group), Outcome 12: Modified Functional Reach test

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Mean Difference IV, Fixed, 95% CI
Lee 2012	16.4	9.7	14	4.1	5.6	14	3.8%	12.30 [6.43 , 18.17]
Lee MM 2018	5.14	1.66	15	4.1	1.82	15	83.1%	1.04 [-0.21 , 2.29]
Shin 2016	7.38	5.5	12	1	0.63	12	13.2%	6.38 [3.25 , 9.51]
Total (95% CI)			**41**			**41**	**100.0%**	**2.17 [1.03 , 3.30]**

Heterogeneity: Chi² = 21.55, df = 2 (P < 0.0001); I² = 91%
Test for overall effect: Z = 3.73 (P = 0.0002)
Test for subgroup differences: Not applicable



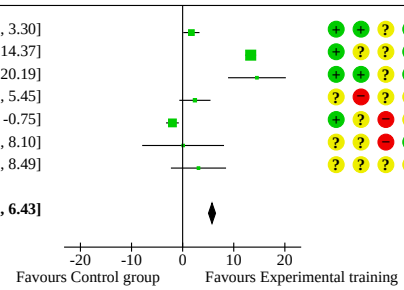


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 1.13. Comparison 1: Experimental training vs control group (Non-dose-matched therapy in control group), Outcome 13: Berg Balance Scale

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Mean Difference IV, Fixed, 95% CI
An 2017	3.07	2.66	15	1.36	1.6	14	18.6%	1.71 [0.12 , 3.30]
Büyükavcı 2016	24.41	2.71	32	11.09	1.36	32	42.4%	13.32 [12.27 , 14.37]
Cabanas-Valdés 2016	23.02	15.95	40	8.48	8.74	39	1.5%	14.54 [8.89 , 20.19]
Lee 2014b	4.1	3.4	10	1.7	3.55	10	5.0%	2.40 [-0.65 , 5.45]
Lee 2016a	0.4	0.9	5	2.4	1.1	5	30.2%	-2.00 [-3.25 , -0.75]
Lee 2020b	2.38	8.2	10	2.29	9.98	10	0.7%	0.09 [-7.92 , 8.10]
Merkert 2011	12.2	10.7	25	9.1	8.3	23	1.6%	3.10 [-2.29 , 8.49]
Total (95% CI)			**137**			**133**	**100.0%**	**5.75 [5.06 , 6.43]**

Heterogeneity: Chi² = 389.84, df = 6 (P < 0.00001); I² = 98%
Test for overall effect: Z = 16.47 (P < 0.00001)
Test for subgroup differences: Not applicable

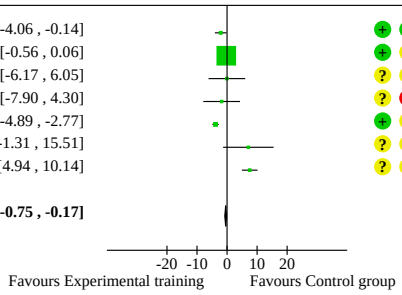


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 1.14. Comparison 1: Experimental training vs control group (Non-dose-matched therapy in control group), Outcome 14: Timed Up and Go Test

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Mean Difference IV, Fixed, 95% CI	Risk of Bias A B C D E F G
An 2017	-4.11	2.24	15	-2.01	3.05	14	2.2%	-2.10 [-4.06 , -0.14]	+ + ? + + − +
Cano-Mañas 2020	-0.53	0.55	23	-0.28	0.54	25	88.5%	-0.25 [-0.56 , 0.06]	+ ? ? + + + −
Chung 2013	5.42	5.61	8	5.48	6.8	8	0.2%	-0.06 [-6.17 , 6.05]	? ? ? ? − + +
Lee 2014b	-4.7	6.19	10	-2.9	8.03	11	0.2%	-1.80 [-7.90 , 4.30]	? − ? ? + + +
Lee 2016a	-1.43	0.5	5	2.4	1.1	5	7.5%	-3.83 [-4.89 , -2.77]	+ ? − ? − − +
Merkert 2011	13.9	13.2	14	6.8	6.9	8	0.1%	7.10 [-1.31 , 15.51]	? ? ? ? − − +
Shin 2016	9.7	4.46	12	2.16	1.13	12	1.2%	7.54 [4.94 , 10.14]	? ? ? + + ? +
Total (95% CI)			**87**			**83**	**100.0%**	**-0.46 [-0.75 , -0.17]**	

Heterogeneity: Chi² = 82.95, df = 6 (P < 0.00001); I² = 93%
Test for overall effect: Z = 3.09 (P = 0.002)
Test for subgroup differences: Not applicable

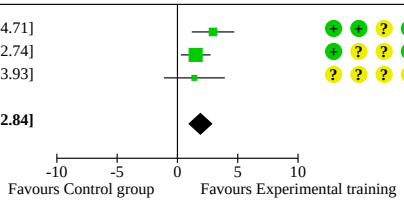


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 1.15. Comparison 1: Experimental training vs control group (Non-dose-matched therapy in control group), Outcome 15: Tinetti Gait

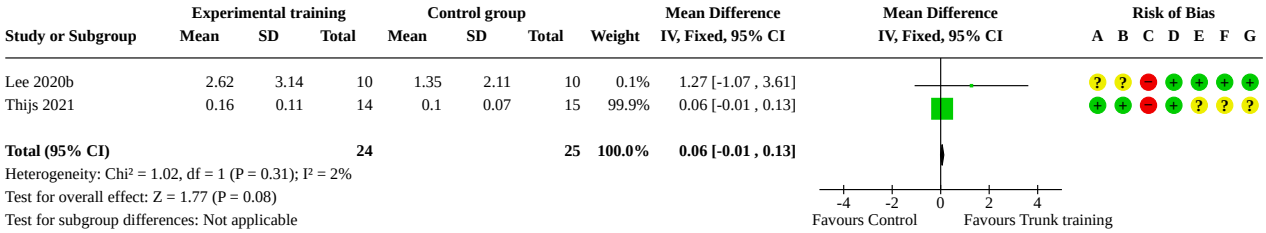
Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Mean Difference IV, Fixed, 95% CI	Risk of Bias A B C D E F G
Cabanas-Valdés 2016	5.57	4.43	40	2.62	3.52	39	28.3%	2.95 [1.19 , 4.71]	+ + ? + + + +
Cano-Mañas 2020	2.53	1.97	23	1.02	2.38	25	57.9%	1.51 [0.28 , 2.74]	+ ? ? + + + −
Merkert 2011	3.9	3	11	2.5	2.6	8	13.8%	1.40 [-1.13 , 3.93]	? ? ? ? − − +
Total (95% CI)			**74**			**72**	**100.0%**	**1.90 [0.96 , 2.84]**	

Heterogeneity: Chi² = 1.90, df = 2 (P = 0.39); I² = 0%
Test for overall effect: Z = 3.98 (P < 0.0001)
Test for subgroup differences: Not applicable



Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 1.16. Comparison 1: Experimental training vs control group (Non-dose-matched therapy in control group), Outcome 16: Ten-Meter Walk Test



Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Comparison 2. Experimental training vs control group (Dose-matched therapy in control group)

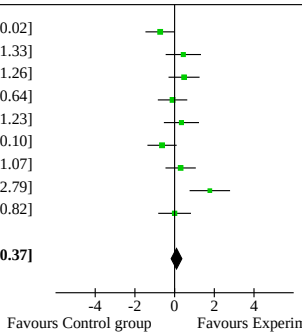
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
2.1 Activities of daily living	9	229	Std. Mean Difference (IV, Fixed, 95% CI)	0.10 [-0.17, 0.37]
2.2 Trunk function	36	1217	Std. Mean Difference (IV, Fixed, 95% CI)	1.03 [0.91, 1.16]
2.3 Arm-hand function	1	19	Std. Mean Difference (IV, Fixed, 95% CI)	0.76 [-0.18, 1.70]
2.4 Arm-hand activity	3	112	Std. Mean Difference (IV, Fixed, 95% CI)	0.17 [-0.21, 0.56]
2.5 Standing balance	22	917	Std. Mean Difference (IV, Fixed, 95% CI)	1.00 [0.86, 1.15]
2.6 Leg function	4	254	Std. Mean Difference (IV, Fixed, 95% CI)	1.57 [1.28, 1.87]
2.7 Walking ability	19	535	Std. Mean Difference (IV, Fixed, 95% CI)	0.69 [0.51, 0.87]
2.8 Quality of life	2	111	Std. Mean Difference (IV, Fixed, 95% CI)	0.70 [0.29, 1.11]
2.9 Death and serious adverse events, including falls	10	381	Peto Odds Ratio (Peto, Fixed, 95% CI)	7.39 [0.15, 372.38]
2.10 Barthel Index	6	151	Mean Difference (IV, Fixed, 95% CI)	2.21 [-0.82, 5.25]
2.10.1 Dose-matched therapy in control group	6	151	Mean Difference (IV, Fixed, 95% CI)	2.21 [-0.82, 5.25]
2.11 Trunk Impairment Scale version 1.0	26	883	Mean Difference (IV, Fixed, 95% CI)	1.87 [1.66, 2.08]
2.12 Modified Functional Reach test	4	112	Mean Difference (IV, Fixed, 95% CI)	0.13 [0.10, 0.16]
2.13 Berg Balance Scale	15	647	Mean Difference (IV, Fixed, 95% CI)	2.22 [1.93, 2.51]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
2.14 Timed Up and Go Test	5	99	Mean Difference (IV, Fixed, 95% CI)	-0.27 [-2.24, 1.70]
2.15 Tinetti Gait	4	171	Mean Difference (IV, Fixed, 95% CI)	2.16 [1.56, 2.76]
2.16 Ten-Meter Walk Test	4	97	Mean Difference (IV, Fixed, 95% CI)	0.32 [0.01, 0.62]

Analysis 2.1. Comparison 2: Experimental training vs control group (Dose-matched therapy in control group), Outcome 1: Activities of daily living

	Experimental training			Control group				Std. Mean Difference	Std. Mean Difference	Risk of Bias
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Fixed, 95% CI	IV, Fixed, 95% CI	A B C D E F G
Chitra 2015	21.2	9.8	15	27.93	8.14	15	13.1%	-0.73 [-1.47 , 0.02]		? ? − ? ? + +
De Sèze 2001	28.4	15.6	10	22.1	11.6	10	9.2%	0.44 [-0.45 , 1.33]		? ? − + + + +
Dubey 2018	19.59	17.71	13	11.85	13.51	13	11.9%	0.48 [-0.31 , 1.26]		? + ? + − + +
Fukata 2019	4.56	7.18	14	5.24	5.43	14	13.2%	-0.10 [-0.85 , 0.64]		? + ? + ? + +
Ko 2016	29.4	12.5	10	24.5	14.7	10	9.3%	0.34 [-0.54 , 1.23]		? ? − + − ? ?
Lee 2017a	8.8	5.9	15	14.1	9.9	15	13.4%	-0.63 [-1.37 , 0.10]		+ + ? ? + + ?
Park 2018a	30.4	21.87	20	24.6	7.9	10	12.4%	0.30 [-0.46 , 1.07]		? ? − ? + ? +
Shah 2016	79.5	13.4	10	49.58	18.2	12	7.0%	1.77 [0.76 , 2.79]		? + ? + + + +
Sharma 2017	0.7	1.19	13	0.7	1.2	10	10.7%	0.00 [-0.82 , 0.82]		+ + ? + + + +
Total (95% CI)			**120**			**109**	**100.0%**	**0.10 [-0.17 , 0.37]**		

Heterogeneity: Chi² = 21.30, df = 8 (P = 0.006); I² = 62%
Test for overall effect: Z = 0.70 (P = 0.48)
Test for subgroup differences: Not applicable

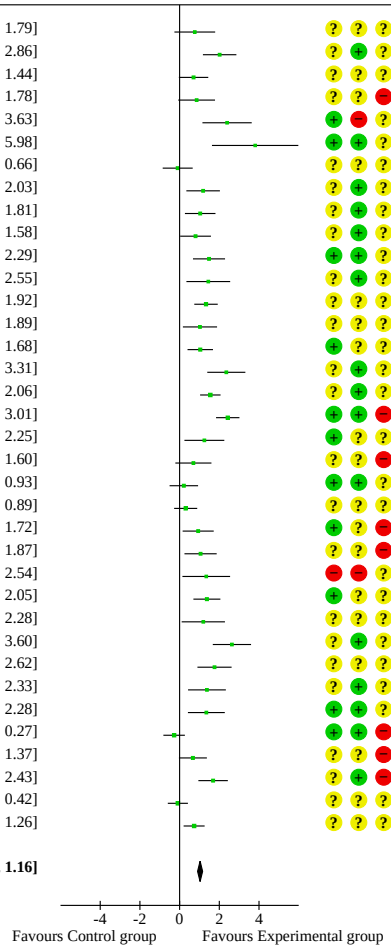


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 2.2. Comparison 2: Experimental training vs control group (Dose-matched therapy in control group), Outcome 2: Trunk function

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Std. Mean Difference IV, Fixed, 95% CI	Risk of Bias A B C D E F G
Bae 2013	3.7	2.46	8	1.8	2.23	8	1.5%	0.77 [-0.26 , 1.79]	? ? ? ? ? ? +
Chan 2015	5.13	2	25	1.3	1.5	12	2.2%	2.02 [1.17 , 2.86]	? + ? + + + +
Choi 2014	6.1	5.9	15	2.4	4.2	15	2.9%	0.70 [-0.04 , 1.44]	? ? ? − + − +
De Sèze 2001	33.7	11.5	10	20	18.3	10	1.9%	0.86 [-0.07 , 1.78]	? ? − + + + +
Dean 1997	0.08	0.05	10	-0.023	0.028	9	1.0%	2.39 [1.15 , 3.63]	+ − ? + + − +
Dean 2007	0.13	0.05	6	-0.04	0.03	6	0.3%	3.81 [1.63 , 5.98]	+ + ? + + − +
DeLuca 2020	1.92	2.26	14	2.15	2.37	13	2.8%	-0.10 [-0.85 , 0.66]	? ? ? + + + +
Dubey 2018	3.96	1.47	13	1.84	1.96	13	2.2%	1.19 [0.34 , 2.03]	? + ? + − + +
Fujino 2016	12.6	9.46	15	4.13	6.06	15	2.7%	1.04 [0.27 , 1.81]	? + ? + + + +
Fukata 2019	4.75	2.35	14	2.81	2.34	14	2.7%	0.80 [0.03 , 1.58]	? + ? + ? + +
Haruyama 2017	4.13	2.31	16	1.19	1.42	15	2.4%	1.48 [0.67 , 2.29]	+ + ? + + + +
Jung 2014	2.4	1.2	9	0.1	1.8	8	1.3%	1.45 [0.34 , 2.55]	? + ? + + + +
Jung 2016a	4.65	2.6	40	1.58	1.4	20	4.6%	1.33 [0.74 , 1.92]	? ? ? ? ? + +
Jung 2016b	4.83	2.17	12	2.42	2.36	12	2.1%	1.03 [0.17 , 1.89]	? ? ? ? ? ? ?
Jung 2017	29.61	24.66	21	10.23	8.59	22	3.9%	1.04 [0.40 , 1.68]	+ ? ? + + + +
Karthikbabu 2011	7.93	1.28	15	4.87	1.25	15	1.7%	2.35 [1.39 , 3.31]	? + ? + + + +
Karthikbabu 2018a	4.24	2.4	58	0.4	2.58	27	6.0%	1.55 [1.03 , 2.06]	? + ? ? − − +
Karthikbabu 2021	4.65	1.52	56	0.6	1.9	28	4.6%	2.42 [1.84 , 3.01]	+ + − ? + − +
Kilinç 2016	2.1	1.28	10	0.66	0.86	9	1.6%	1.25 [0.24 , 2.25]	+ ? ? + − + +
Ko 2016	7.1	4.5	10	3.8	4.6	10	1.9%	0.69 [-0.21 , 1.60]	? ? − + − ? ?
Lee 2017a	3.7	3.2	15	3.1	2.2	15	3.1%	0.21 [-0.51 , 0.93]	+ + ? ? + + ?
Lee 2017b	1.4	2.51	23	0.6	2.63	23	4.7%	0.31 [-0.28 , 0.89]	? ? ? ? ? ? ?
Lee 2020a	3.3	1.75	12	1.7	1.6	17	2.6%	0.94 [0.15 , 1.72]	+ ? − + + + +
Park 2018a	6.8	3.65	20	3.1	2.83	10	2.4%	1.06 [0.24 , 1.87]	? ? − ? + ? +
Park 2018b	4.3	1.59	7	1.7	2.01	7	1.1%	1.34 [0.14 , 2.54]	− − ? ? − ? ?
Park 2020	1.67	0.79	21	0.57	0.78	21	3.5%	1.37 [0.70 , 2.05]	+ ? ? ? − ? +
Renald 2016	6.5	1.84	8	4.38	1.5	8	1.3%	1.19 [0.10 , 2.28]	? ? ? + + − ?
Saeys 2012	8.72	1.965	18	2.87	2.386	15	1.7%	2.64 [1.67 , 3.60]	? + ? + + + +
Sarwar 2019	6	1.65	15	3.5	1.05	15	2.2%	1.76 [0.90 , 2.62]	? ? ? ? + − ?
Shah 2016	18	2.44	10	12	5.2	12	1.8%	1.38 [0.43 , 2.33]	? + ? + + + +
Sharma 2017	4.54	0.78	13	3.1	1.29	10	1.8%	1.35 [0.42 , 2.28]	+ + ? + + + +
Sheehy 2020	3.4	7.33	26	5.3	6.21	27	5.4%	-0.28 [-0.82 , 0.27]	+ + − + − − ?
Shim 2020	4.41	1.58	17	3.44	1.21	16	3.2%	0.67 [-0.03 , 1.37]	? ? − − − − ?
Van Criekinge 2020	4.37	2.37	19	0.4	2.24	20	2.9%	1.69 [0.95 , 2.43]	? + − + + + +
Viswaja 2015	5.07	1.12	30	5.17	1.13	30	6.2%	-0.09 [-0.59 , 0.42]	? ? ? ? ? − ?
Yoo 2010	4.78	3.99	28	2.45	2.11	31	5.7%	0.73 [0.20 , 1.26]	? ? ? ? ? + +
Total (95% CI)			**659**			**558**	**100.0%**	**1.03 [0.91 , 1.16]**	

Heterogeneity: Chi² = 135.54, df = 35 (P < 0.00001); I² = 74%
Test for overall effect: Z = 16.04 (P < 0.00001)
Test for subgroup differences: Not applicable

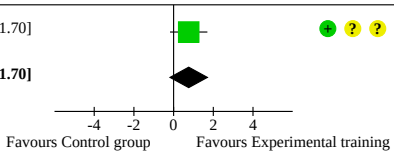


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 2.3. Comparison 2: Experimental training vs control group (Dose-matched therapy in control group), Outcome 3: Arm-hand function

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Std. Mean Difference IV, Fixed, 95% CI	Risk of Bias A B C D E F G
Kilinç 2016	3.3	3.62	10	1.13	1.02	9	100.0%	0.76 [-0.18 , 1.70]	+ ? ? + − + +
Total (95% CI)			**10**			**9**	**100.0%**	**0.76 [-0.18 , 1.70]**	

Heterogeneity: Not applicable
Test for overall effect: Z = 1.58 (P = 0.11)
Test for subgroup differences: Not applicable

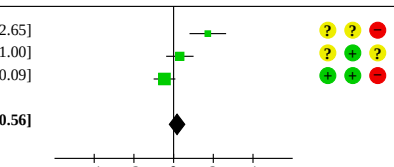


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 2.4. Comparison 2: Experimental training vs control group (Dose-matched therapy in control group), Outcome 4: Arm-hand activity

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Std. Mean Difference IV, Fixed, 95% CI	Risk of Bias A B C D E F G
Park J 2017	3.62	1.33	13	1.62	0.87	13	17.8%	1.72 [0.80 , 2.65]	? ? − ? + + ?
Saeys 2012	3	2.93	18	2	3.29	15	31.7%	0.31 [-0.38 , 1.00]	? + ? + + + +
Sheehy 2020	3.8	7.9	26	7.5	7.98	27	50.6%	-0.46 [-1.01 , 0.09]	+ + − + − − ?
Total (95% CI)			**57**			**55**	**100.0%**	**0.17 [-0.21 , 0.56]**	

Heterogeneity: Chi² = 16.18, df = 2 (P = 0.0003); I² = 88%
Test for overall effect: Z = 0.88 (P = 0.38)
Test for subgroup differences: Not applicable

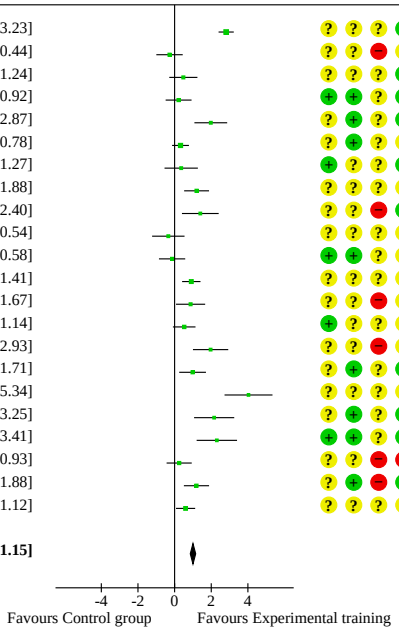


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 2.5. Comparison 2: Experimental training vs control group (Dose-matched therapy in control group), Outcome 5: Standing balance

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Std. Mean Difference IV, Fixed, 95% CI	Risk of Bias A B C D E F G
Chen 2020	16.24	2.08	90	10.65	1.87	90	12.6%	2.81 [2.40 , 3.23]	? ? ? + ? ? +
Chitra 2015	8.53	5.58	15	10.07	5.23	15	4.2%	-0.28 [-1.00 , 0.44]	? ? − ? ? + +
DeLuca 2020	2.71	3.26	14	1.23	2.71	13	3.7%	0.48 [-0.29 , 1.24]	? ? ? + + + +
Haruyama 2017	3.38	5.3	16	2.28	4.5	15	4.3%	0.22 [-0.49 , 0.92]	+ + ? + + + +
Karthikbabu 2011	6.2	0.94	15	4.4	0.83	15	2.7%	1.98 [1.08 , 2.87]	? + ? + + + +
Karthikbabu 2018a	2.3	5.12	58	0.8	3.22	27	10.2%	0.32 [-0.14 , 0.78]	? + ? ? − − +
Kilinç 2016	0.4	0.51	10	0.22	0.44	9	2.6%	0.36 [-0.55 , 1.27]	+ ? ? + − + +
Kim 2011	4.6	4.18	20	0.1	3.09	20	4.7%	1.20 [0.52 , 1.88]	? ? ? ? − + ?
Ko 2016	25.1	11	10	10.7	8.5	10	2.2%	1.40 [0.40 , 2.40]	? ? − + − ? ?
Lee 2014a	1	3.31	10	2.6	5.38	10	2.8%	-0.34 [-1.23 , 0.54]	? ? ? ? ? − ?
Lee 2017a	2.1	2.2	15	2.6	4.5	15	4.2%	-0.14 [-0.85 , 0.58]	+ + ? ? + + ?
Park 2013	5.41	2.73	34	3.17	2.09	34	8.6%	0.91 [0.41 , 1.41]	? ? ? ? ? + ?
Park 2018a	19.2	13.13	20	8.4	9.34	10	3.4%	0.87 [0.08 , 1.67]	? ? − ? + ? +
Park 2020	1.95	2.55	21	0.62	2.43	21	5.7%	0.52 [-0.09 , 1.14]	+ ? ? ? − ? +
Park J 2017	6.08	2.1	13	1.9	2.02	13	2.3%	1.96 [1.00 , 2.93]	? ? − ? + + ?
Saeys 2012	19.39	11.241	18	9.2	8.612	15	4.0%	0.98 [0.25 , 1.71]	? + ? + + + +
Sarwar 2019	24.3	2.51	15	14.8	2.05	15	1.3%	4.03 [2.73 , 5.34]	? ? ? ? + − ?
Shah 2016	9.1	1.42	10	5.42	1.8	12	1.8%	2.16 [1.06 , 3.25]	? + ? + + + +
Sharma 2017	4.53	0.99	13	2.1	1.05	10	1.8%	2.30 [1.20 , 3.41]	+ + ? + + + +
Shim 2020	5.35	1.97	17	4.81	2.26	16	4.6%	0.25 [-0.44 , 0.93]	? ? − − − − ?
Van Criekinge 2020	5.89	3.29	19	1.8	3.42	20	4.6%	1.19 [0.51 , 1.88]	? + − + + + +
Yoo 2010	11.29	9.19	28	6.23	7.47	31	7.9%	0.60 [0.08 , 1.12]	? ? ? ? ? + +
Total (95% CI)			**481**			**436**	**100.0%**	**1.00 [0.86 , 1.15]**	

Heterogeneity: Chi² = 170.41, df = 21 (P < 0.00001); I² = 88%
Test for overall effect: Z = 13.38 (P < 0.00001)
Test for subgroup differences: Not applicable

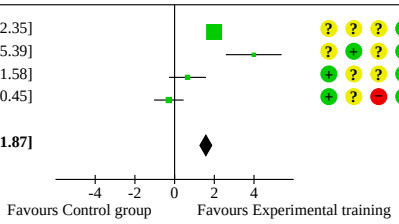


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 2.6. Comparison 2: Experimental training vs control group (Dose-matched therapy in control group), Outcome 6: Leg function

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Std. Mean Difference IV, Fixed, 95% CI	Risk of Bias A B C D E F G
Chen 2020	12.28	1.29	90	9.54	1.45	90	69.1%	1.99 [1.63 , 2.35]	? ? ? + ? ? +
Dubey 2018	6.91	1.05	13	1.77	1.42	13	4.5%	3.99 [2.58 , 5.39]	? + ? + − + +
Kilinç 2016	3.2	2.78	10	1.44	2.35	9	10.3%	0.65 [-0.28 , 1.58]	+ ? ? + − + +
Lee 2020a	0.3	3.56	12	1.3	3.15	17	16.1%	-0.29 [-1.04 , 0.45]	+ ? − + + + +
Total (95% CI)			**125**			**129**	**100.0%**	**1.57 [1.28 , 1.87]**	

Heterogeneity: Chi² = 44.46, df = 3 (P < 0.00001); I² = 93%
Test for overall effect: Z = 10.35 (P < 0.00001)
Test for subgroup differences: Not applicable

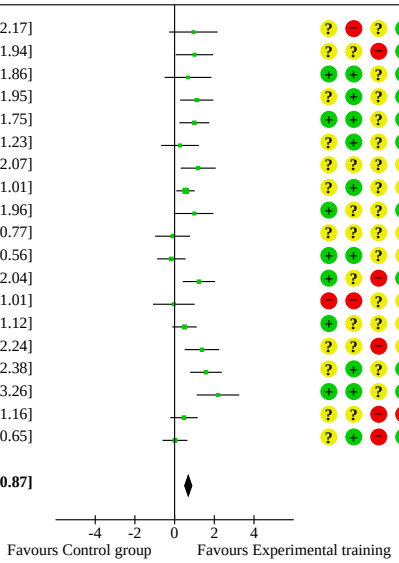


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 2.7. Comparison 2: Experimental training vs control group (Dose-matched therapy in control group), Outcome 7: Walking ability

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Std. Mean Difference IV, Fixed, 95% CI	Risk of Bias A B C D E F G
Chung 2014	13.1	7.5	6	5.9	6.5	6	2.2%	0.95 [-0.28 , 2.17]	? - ? + - + ?
De Sèze 2001	2.2	1	10	1.1	1.1	10	3.7%	1.00 [0.06 , 1.94]	? ? - + + + +
Dean 2007	0.4	0.35	6	0.2	0.16	6	2.4%	0.68 [-0.50 , 1.86]	+ + ? + + - +
Dubey 2018	0.2	0.19	13	0.04	0.05	13	4.7%	1.12 [0.28 , 1.95]	? + ? + - + +
Haruyama 2017	13.67	12.62	16	1.33	11.5	15	5.8%	0.99 [0.24 , 1.75]	+ + ? + + + +
Jung 2014	5	9.85	9	2.6	6.29	8	3.6%	0.27 [-0.69 , 1.23]	? + ? + + + +
Jung 2016b	5.4	3.5	12	1.6	2.6	12	4.2%	1.19 [0.31 , 2.07]	? ? ? ? ? ? ?
Karthikbabu 2018a	0.11	0.1	58	0.04	0.17	27	15.2%	0.55 [0.09 , 1.01]	? + ? ? - - +
Kilinç 2016	5.68	6.34	10	0.71	1.95	9	3.5%	0.99 [0.02 , 1.96]	+ ? ? + - + +
Lee 2014a	1.18	8.57	10	2.15	9.53	10	4.3%	-0.10 [-0.98 , 0.77]	? ? ? ? ? - ?
Lee 2017a	0.4	0.5	15	0.5	0.7	15	6.4%	-0.16 [-0.88 , 0.56]	+ + ? ? + + ?
Lee 2020a	12.4	9.04	12	-2	12.78	17	5.0%	1.23 [0.41 , 2.04]	+ ? - + + + +
Park 2018b	16.4	31.21	7	17.9	38.69	7	3.0%	-0.04 [-1.09 , 1.01]	- - ? ? - ? ?
Park 2020	2.52	3.14	21	1	2.81	21	8.7%	0.50 [-0.11 , 1.12]	+ ? ? ? - ? +
Park J 2017	5.78	4.47	13	0.96	1.76	13	4.3%	1.37 [0.50 , 2.24]	? ? - ? + + ?
Saeys 2012	5.89	2.88	18	1.8	2.007	15	5.2%	1.58 [0.78 , 2.38]	? + ? + + + +
Sharma 2017	7.01	1.2	13	4.09	1.4	10	2.8%	2.18 [1.11 , 3.26]	+ + ? + + + +
Shim 2020	4	1.54	17	3.31	1.3	16	6.8%	0.47 [-0.22 , 1.16]	? ? - - - - ?
Van Criekinge 2020	0.12	4.05	19	0.05	2.3	20	8.3%	0.02 [-0.61 , 0.65]	? + - + + + +
Total (95% CI)			**285**			**250**	**100.0%**	**0.69 [0.51 , 0.87]**	

Heterogeneity: Chi² = 36.65, df = 18 (P = 0.006); I² = 51%
Test for overall effect: Z = 7.44 (P < 0.00001)
Test for subgroup differences: Not applicable

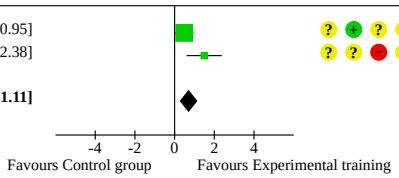


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 2.8. Comparison 2: Experimental training vs control group (Dose-matched therapy in control group), Outcome 8: Quality of life

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Std. Mean Difference IV, Fixed, 95% CI	Risk of Bias A B C D E F G
Karthikbabu 2018a	13.78	16.03	58	5.8	16.63	27	78.6%	0.49 [0.02 , 0.95]	? + ? ? - - +
Park J 2017	17.31	7.11	13	5.31	8.41	13	21.4%	1.49 [0.61 , 2.38]	? ? - ? + + ?
Total (95% CI)			**71**			**40**	**100.0%**	**0.70 [0.29 , 1.11]**	

Heterogeneity: Chi² = 3.88, df = 1 (P = 0.05); I² = 74%
Test for overall effect: Z = 3.36 (P = 0.0008)
Test for subgroup differences: Not applicable

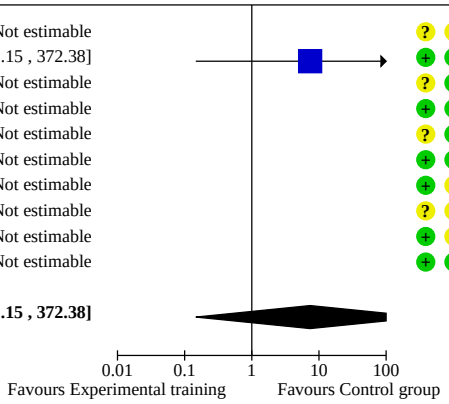


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 2.9. Comparison 2: Experimental training vs control group (Dose-matched therapy in control group), Outcome 9: Death and serious adverse events, including falls

Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Peto Odds Ratio Peto, Fixed, 95% CI	Risk of Bias A B C D E F G
De Sèze 2001	0	10	0	10		Not estimable	? ? − + + + +
Dean 2007	1	6	0	6	100.0%	7.39 [0.15 , 372.38]	+ + ? + + − +
Fukata 2019	0	14	0	14		Not estimable	? + ? + ? + +
Haruyama 2017	0	16	0	15		Not estimable	+ + ? + + + +
Karthikbabu 2018a	0	58	0	27		Not estimable	? + ? ? − − +
Lee 2017a	0	15	0	15		Not estimable	+ + ? ? + + ?
Liu 2020	0	25	0	25		Not estimable	+ ? ? + + − +
Park 2018a	0	20	0	10		Not estimable	? ? − ? + ? +
Park 2020	0	21	0	21		Not estimable	+ ? ? ? − ? +
Sheehy 2020	0	26	0	27		Not estimable	+ + − + − − ?
Total (95% CI)		**211**		**170**	**100.0%**	**7.39 [0.15 , 372.38]**	
Total events:	1		0				

Heterogeneity: Not applicable
Test for overall effect: Z = 1.00 (P = 0.32)
Test for subgroup differences: Not applicable



Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

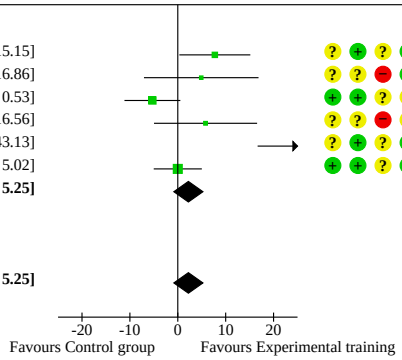
Analysis 2.10. Comparison 2: Experimental training vs control group (Dose-matched therapy in control group), Outcome 10: Barthel Index

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Mean Difference IV, Fixed, 95% CI	Risk of Bias A B C D E F G
2.10.1 Dose-matched therapy in control group									
Dubey 2018	19.59	1.77	13	11.85	13.51	13	16.8%	7.74 [0.33 , 15.15]	? + ? + − + +
Ko 2016	29.4	12.5	10	24.5	14.7	10	6.4%	4.90 [-7.06 , 16.86]	? ? − + − ? ?
Lee 2017a	8.8	5.9	15	14.1	9.9	15	27.1%	-5.30 [-11.13 , 0.53]	+ + ? ? + + ?
Park 2018a	30.4	21.87	20	24.6	7.9	10	7.9%	5.80 [-4.96 , 16.56]	? ? − ? + ? +
Shah 2016	79.5	13.4	10	49.6	18.2	12	5.3%	29.90 [16.67 , 43.13]	? + ? + + + +
Sharma 2017	3.5	5.95	13	3.5	6.2	10	36.5%	0.00 [-5.02 , 5.02]	+ + ? + + + +
Subtotal (95% CI)			**81**			**70**	**100.0%**	**2.21 [-0.82 , 5.25]**	

Heterogeneity: Chi² = 26.71, df = 5 (P < 0.0001); I² = 81%
Test for overall effect: Z = 1.43 (P = 0.15)

Total (95% CI)			**81**			**70**	**100.0%**	**2.21 [-0.82 , 5.25]**	

Heterogeneity: Chi² = 26.71, df = 5 (P < 0.0001); I² = 81%
Test for overall effect: Z = 1.43 (P = 0.15)
Test for subgroup differences: Not applicable

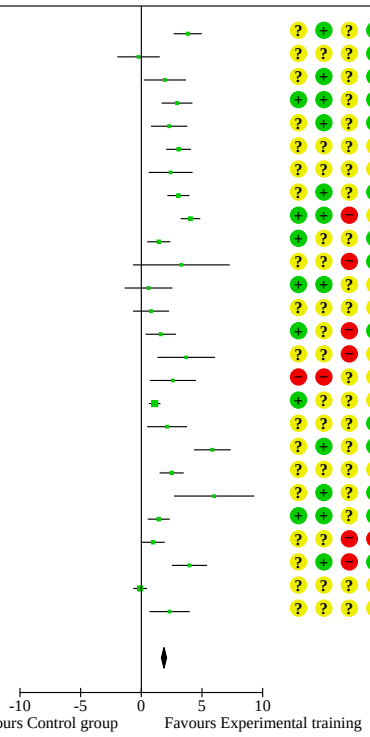


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 2.11. Comparison 2: Experimental training vs control group (Dose-matched therapy in control group), Outcome 11: Trunk Impairment Scale version 1.0

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Mean Difference IV, Fixed, 95% CI	Risk of Bias A B C D E F G
Chan 2015	5.13	2	25	1.3	1.5	12	3.4%	3.83 [2.67 , 4.99]	? + ? + + + +
DeLuca 2020	1.92	2.26	14	2.15	2.37	13	1.5%	-0.23 [-1.98 , 1.52]	? ? ? + + + +
Fukata 2019	4.75	2.35	14	2.81	2.34	14	1.5%	1.94 [0.20 , 3.68]	? + ? + ? + +
Haruyama 2017	4.13	2.13	16	1.19	1.42	15	2.8%	2.94 [1.67 , 4.21]	+ + ? + + + +
Jung 2014	2.4	1.2	8	0.1	1.8	8	2.0%	2.30 [0.80 , 3.80]	? + ? + + + +
Jung 2016a	4.65	2.6	40	1.58	1.4	20	4.4%	3.07 [2.06 , 4.08]	? ? ? ? ? + +
Jung 2016b	4.83	2.17	12	2.42	2.35	12	1.4%	2.41 [0.60 , 4.22]	? ? ? ? ? ? ?
Karthikbabu 2011	7.93	1.28	15	4.87	1.25	15	5.5%	3.06 [2.15 , 3.97]	? + ? + + + +
Karthikbabu 2021	4.65	1.52	56	0.6	1.9	28	6.9%	4.05 [3.24 , 4.86]	+ + − ? + − +
Kilinç 2016	2.1	1.28	10	0.66	0.86	10	5.0%	1.44 [0.48 , 2.40]	+ ? ? + − + +
Ko 2016	7.1	4.5	10	3.8	4.6	10	0.3%	3.30 [-0.69 , 7.29]	? ? − + − ? ?
Lee 2017a	3.7	3.2	15	3.1	2.2	15	1.2%	0.60 [-1.37 , 2.57]	+ + ? ? + + ?
Lee 2017b	1.4	2.51	23	0.6	2.63	23	2.1%	0.80 [-0.69 , 2.29]	? ? ? ? ? ? ?
Lee 2020a	3.3	1.75	12	1.7	1.6	17	2.9%	1.60 [0.35 , 2.85]	+ ? − + + + +
Park 2018a	6.8	3.65	20	3.1	2.83	10	0.8%	3.70 [1.33 , 6.07]	? ? − ? + ? +
Park 2018b	4.3	1.59	7	1.7	2.01	7	1.3%	2.60 [0.70 , 4.50]	− − ? ? − ? ?
Park 2020	1.67	0.79	21	0.57	0.78	21	20.1%	1.10 [0.63 , 1.57]	+ ? ? ? − ? +
Renald 2016	6.5	1.84	8	4.38	1.5	8	1.7%	2.12 [0.47 , 3.77]	? ? ? + + − ?
Saeys 2012	8.72	1.965	18	2.87	2.386	15	2.0%	5.85 [4.34 , 7.36]	? + ? + + + +
Sarwar 2019	6	1.65	15	3.5	1.05	15	4.6%	2.50 [1.51 , 3.49]	? ? ? ? + − ?
Shah 2016	18	2.44	10	12	5.2	12	0.4%	6.00 [2.69 , 9.31]	? + ? + + + +
Sharma 2017	4.54	0.78	13	3.1	1.29	10	5.5%	1.44 [0.53 , 2.35]	+ + ? + + + +
Shim 2020	4.41	1.58	17	3.44	1.21	16	4.9%	0.97 [0.01 , 1.93]	? ? − − − − ?
Van Criekinge 2020	4.37	2.37	19	0.4	2.24	20	2.2%	3.97 [2.52 , 5.42]	? + − + + + +
Viswaja 2015	5.07	1.12	30	5.17	1.13	30	14.0%	-0.10 [-0.67 , 0.47]	? ? ? ? ? − ?
Yoo 2010	4.78	3.99	28	2.45	2.11	31	1.7%	2.33 [0.68 , 3.98]	? ? ? ? ? + +
Total (95% CI)			**476**			**407**	**100.0%**	**1.87 [1.66 , 2.08]**	

Heterogeneity: Chi² = 170.87, df = 25 (P < 0.00001); I² = 85%
Test for overall effect: Z = 17.20 (P < 0.00001)
Test for subgroup differences: Not applicable

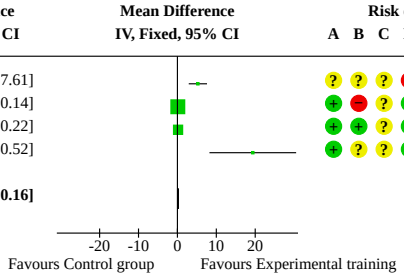


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 2.12. Comparison 2: Experimental training vs control group (Dose-matched therapy in control group), Outcome 12: Modified Functional Reach test

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Mean Difference IV, Fixed, 95% CI	Risk of Bias A B C D E F G
Choi 2014	6.1	4.12	23	0.84	3.23	15	0.0%	5.26 [2.91 , 7.61]	? ? ? − + − +
Dean 1997	0.08	0.05	10	-0.023	0.028	9	62.7%	0.10 [0.07 , 0.14]	+ − ? + + − +
Dean 2007	0.13	0.05	6	-0.04	0.03	6	37.3%	0.17 [0.12 , 0.22]	+ + ? + + − +
Jung 2017	29.61	24.66	21	10.23	8.59	22	0.0%	19.38 [8.24 , 30.52]	+ ? ? + + + +
Total (95% CI)			**60**			**52**	**100.0%**	**0.13 [0.10 , 0.16]**	

Heterogeneity: Chi² = 34.81, df = 3 (P < 0.00001); I² = 91%
Test for overall effect: Z = 8.86 (P < 0.00001)
Test for subgroup differences: Not applicable

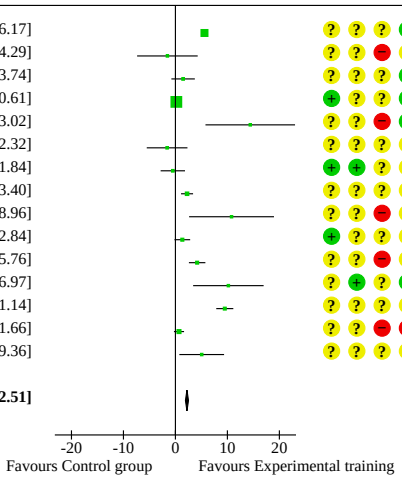


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 2.13. Comparison 2: Experimental training vs control group (Dose-matched therapy in control group), Outcome 13: Berg Balance Scale

Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Mean Difference IV, Fixed, 95% CI	Risk of Bias A B C D E F G
Chen 2020	16.24	2.08	90	10.65	1.87	90	24.8%	5.59 [5.01 , 6.17]	? ? ? + ? ? +
Chitra 2015	8.53	5.58	15	10.07	10.07	15	0.2%	-1.54 [-7.37 , 4.29]	? ? - ? ? + +
DeLuca 2020	2.71	3.26	14	1.23	2.71	13	1.6%	1.48 [-0.78 , 3.74]	? ? ? + + + +
Kilinç 2016	0.4	0.51	10	0.22	0.44	9	45.4%	0.18 [-0.25 , 0.61]	+ ? ? + - + +
Ko 2016	25.1	11	10	10.7	8.5	10	0.1%	14.40 [5.78 , 23.02]	? ? - + - ? ?
Lee 2014a	1	3.31	10	2.6	5.38	10	0.5%	-1.60 [-5.52 , 2.32]	? ? ? ? ? - ?
Lee 2017a	2.1	1.1	15	2.6	4.5	15	1.5%	-0.50 [-2.84 , 1.84]	+ + ? ? + + ?
Park 2013	5.41	2.73	34	3.17	2.09	34	6.2%	2.24 [1.08 , 3.40]	? ? ? ? ? + ?
Park 2018a	19.2	13.13	20	8.4	9.34	10	0.1%	10.80 [2.64 , 18.96]	? ? - ? + ? +
Park 2020	1.95	2.55	21	0.62	2.43	21	3.6%	1.33 [-0.18 , 2.84]	+ ? ? ? - ? +
Park J 2017	6.08	2.1	13	1.9	2.02	13	3.3%	4.18 [2.60 , 5.76]	? ? - ? + + ?
Saeys 2012	19.39	11.241	18	9.2	8.612	15	0.2%	10.19 [3.41 , 16.97]	? + ? + + + +
Sarwar 2019	24.3	2.51	15	14.8	2.05	15	3.1%	9.50 [7.86 , 11.14]	? ? ? ? + - ?
Shim 2020	4	1.54	17	3.31	1.3	16	8.8%	0.69 [-0.28 , 1.66]	? ? - - - - ?
Yoo 2010	11.29	9.19	28	6.23	7.47	31	0.4%	5.06 [0.76 , 9.36]	? ? ? ? ? + +
Total (95% CI)			**330**			**317**	**100.0%**	**2.22 [1.93 , 2.51]**	

Heterogeneity: Chi² = 340.44, df = 14 (P < 0.00001); I² = 96%
Test for overall effect: Z = 15.13 (P < 0.00001)
Test for subgroup differences: Not applicable

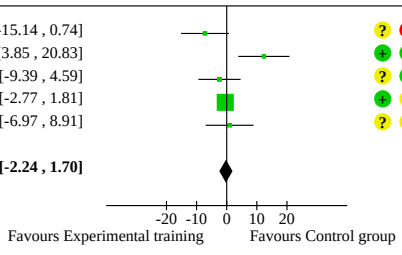


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 2.14. Comparison 2: Experimental training vs control group (Dose-matched therapy in control group), Outcome 14: Timed Up and Go Test

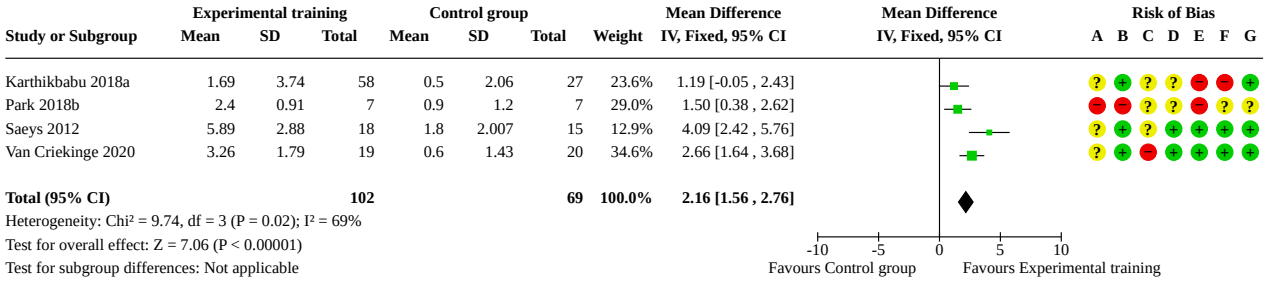
Study or Subgroup	Experimental training Mean	SD	Total	Control group Mean	SD	Total	Weight	Mean Difference IV, Fixed, 95% CI	Risk of Bias A B C D E F G
Chung 2014	-13.1	7.5	6	-5.9	6.5	6	6.2%	-7.20 [-15.14 , 0.74]	? - ? + - + ?
Haruyama 2017	13.67	12.62	16	1.33	11.5	15	5.4%	12.34 [3.85 , 20.83]	+ + ? + + + +
Jung 2014	-5	8.86	9	-2.6	5.66	8	7.9%	-2.40 [-9.39 , 4.59]	? + ? + + + +
Kilinç 2016	-2.68	3.17	10	-2.2	1.79	9	74.3%	-0.48 [-2.77 , 1.81]	+ ? ? + - + +
Lee 2014a	-1.18	8.57	10	-2.15	9.53	10	6.2%	0.97 [-6.97 , 8.91]	? ? ? ? ? - ?
Total (95% CI)			**51**			**48**	**100.0%**	**-0.27 [-2.24 , 1.70]**	

Heterogeneity: Chi² = 11.88, df = 4 (P = 0.02); I² = 66%
Test for overall effect: Z = 0.26 (P = 0.79)
Test for subgroup differences: Not applicable



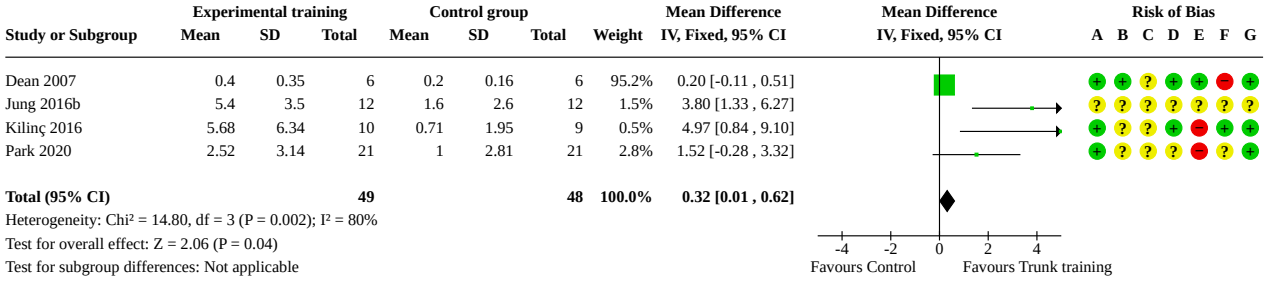
Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 2.15. Comparison 2: Experimental training vs control group (Dose-matched therapy in control group), Outcome 15: Tinetti Gait



Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Analysis 2.16. Comparison 2: Experimental training vs control group (Dose-matched therapy in control group), Outcome 16: Ten-Meter Walk Test



Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

ADDITIONAL TABLES

Table 1. Overview of published reviews on trunk training

Review	Cabanas-Valdés 2013	Sorinola 2014	Alhwoaimel 2018	Van Criekinge 2019	Souza 2019
Aim	To evaluate the effectiveness of trunk training exercises on trunk performance, sitting balance, standing balance, and gait	To establish the efficacy of additional trunk exercise on trunk function, balance, walking ability, and functional independence early after stroke	To evaluate the effects of trunk training on trunk control and upper extremity function	To study effectiveness of trunk training on standing balance, and mobility	To assess the impact of the addition of specific inpatient trunk training in the first 3 months after stroke

Table 1. Overview of published reviews on trunk training *(Continued)*

Type of studies	RCTs	RCTs	RCTs	RCTs	RCTs
Clear distinction made in which experimental group receives additional therapy	No Therapy intervention in control group was a combination of no therapy, non-dose-matched therapy and dose-matched therapy.	No Therapy intervention in control group was a combination of no therapy, non-dose-matched therapy and dose-matched therapy.	No Therapy intervention in control group was a combination of no therapy, non-dose-matched therapy and dose-matched therapy.	No Therapy intervention in control group was a combination of no therapy, non-dose-matched therapy and dose-matched therapy.	No Therapy intervention in control group was a combination of no therapy, non-dose-matched therapy and dose-matched therapy.
Number of studies included	11 studies (317 participants)	6 studies (155 participants)	17 studies (599 participants)	22 studies (788 participants)	9 studies (358 participants)
Evaluation of quality of evidence	PEDro score	PEDro score	PEDro score	PEDro score	PEDro score
Evaluation of risk of bias	No	Yes Cochrane risk of bias tool	Yes Cochrane risk of bias tool	No	Yes Cochrane risk of bias tool
Performed meta-analysis	No Narrative review	Yes	Yes	Yes	Yes Performed on limited number of studies, with same outcome measure
Distinction between type or therapy	Yes Sitting-reaching training and selective-trunk training	No	No	No	No
Last search date	November 2012	July 2012	February 2017	January 2019	December 2017
Evaluated outcomes					
Trunk function	Yes 10 RCTs	Yes 6 RCTs	Yes 17 RCTs	Yes 20 RCTs	Yes 8 RCTs
Standing balance	Yes 6 RCTs	Yes 2 RCTs	No	Yes 6 RCTs	Yes 4 RCTs
Gait	Yes 5 RCTs	Yes 3 RCTs	No	Yes 8 RCTs	No

Table 1. Overview of published reviews on trunk training *(Continued)*

Functional performance	No	Yes 2 RCTs	No	No	No
Upper limb outcomes	No	No	Yes No studies included	No	No
Activities of daily living	No	No	No	No	No
Quality of life	Yes 1 RCT	No	No	No	No
Adverse events	No	No	No	No	No
Other outcomes	No	No	No	No	No
Conclusion	Moderate evidence to improve trunk performance and quality of life Trials were inconclusive about outcome on gait and balance.	Moderate, non-significant effect on trunk function, large effects on standing balance, small, non-significant effect on functional independence	Large significant effect on trunk performance	Large significant effect on trunk control, standing balance and mobility	Significant improvement in trunk control and balance

PEDro: Physiotherapy Evidence Database (PEDro)-scale
RCT: randomised controlled trial

Table 2. Summary characteristics of included studies: participant characteristics

Study ID	Number participants: experimental group	Number participants: control group	Mean age and (SD): experimental group	Mean age and (SD): control group	Phase post-stroke
An 2017	15	14	59.73 (8.94)	57.07 (17.17)	Chronic
Bae 2013	8	8	52.4 (7.6)	53.4 (5.8)	Chronic
Bilek 2020	30	30	51.3 (3.7)	62.6 (2.2)	—
Büyükavcı 2016	33	32	62.6 (10.5)	63.6 (10.4)	Early subacute
Cabanas-Valdés 2016	40	39	74.92	75.69	Early subacute

Table 2. Summary characteristics of included studies: participant characteristics *(Continued)*

			(10.7)	(9.4)	
Cano-Mañas 2020	23	25	60.35 (9.84)	65.68 (10.39)	Late subacute
Chan 2015	25	12	58.2 (10.7)	56.3 (7,4)	Chronic
Chen 2020	90	90	—	—	Early subacute
Chitra 2015	15	15	52.07 (5.98)	55.27 (8,25)	Late subacute
Choi 2014	15	15	62.8 (9)	65.1 (15.7)	Chronic
Chung 2013	8	8	44.37 (9.9)	48.38 (9.72)	Chronic
Chung 2014	9	10	51.1 (9,2)	49 (9.2)	Chronic
Dean 1997	10	10	68.2 (8.2)	66.9 (5.9)	Chronic
Dean 2007	6	6	60 (7)	74 (12)	Early subacute
DeLuca 2020	15	15	58.53 (1.87)	63.46 (2.51)	Chronic
De Sèze 2001	10	10	63.5 (17)	67.7 (15)	Early subacute
Seo 2012	6	6	59.8 (12.8)	57.83 (10.7)	Chronic
Dubey 2018	17	17	53.35 (11.64)	58.24 (11.77)	Chronic
El-Nashar 2019	15	15	59.86 (8.14)	56.9 (7.24)	Chronic
Fujino 2016	15	15	67.9 (7.8)	64.4 (7.5)	Early subacute
Fukata 2019	16	17	68.9	67.6	Early subacute

Table 2. Summary characteristics of included studies: participant characteristics *(Continued)*

			(9.6)	(12.7)	
Haruyama 2017	16	16	67.5 (10.11)	65.63 (11.97)	Late subacute
Jung 2014	9	8	51.9 (10.3)	57.9 (8.5)	Chronic
Jung 2016b	40	20	55.4 (10.4)	56.1 (10.8)	—
Jung 2016a	12	12	58.9 (11)	60.7 (7.8)	Chronic
Jung 2017	21	22	62.52 (8.82)	64.55 (10.67)	Chronic
Karthikbabu 2011	15	15	59.8 (10.5)	55 (6.5)	Early subacute
Karthikbabu 2018a	72	36	55.6 (12.8)	54.8 (12.5)	Chronic
Karthikbabu 2021	56	28	56.9 (12.1)	54.6 (12.7)	Chronic
Kilinç 2016	12	10	55.91 (7.92)	54 (13.64)	Chronic
Kim 2011	20	20	51.4 (5.7)	53,5 (7.1)	Chronic
Ko 2016	20	10	—	—	Early subacute
Kumar 2011	10	10	59.5 (12.09)	57.8 (13.49)	Early subacute
Lee 2012	14	14	59 (11)	62.3 (14.2)	Chronic
Lee 2014a	10	10	63.4 (4.94)	62.5 (8.48)	—
Lee 2016a	5	5	65.2 (5)	66.2 (3.4)	Late subacute
Lee 2017b	23	23	60.4	58.1	Chronic

Table 2. Summary characteristics of included studies: participant characteristics *(Continued)*

			(10.5)	(10.7)	
Lee 2017a	15	15	59.1 (16.9)	64.4 (14.8)	Early subacute
Lee MM 2018	15	15	61.8 (6.8)	61.33 (8.44)	Late subacute
Lee 2020a	18	17	60.2 (11.7)	62.4 (13.3)	late subacute
Lee 2020b	20	10	69.57 (11.75)	66.89 (10)	Chronic
Lee 2014b	10	11	47.9 (12)	54 (11.9)	Chronic
Liu 2020	25	25	56.52 (9.22)	56.6 (9.12)	—
Marzouk 2019	15	15	—	—	—
Merkert 2011	33	33	74.5 (8.3)	74.5 (8.6)	Late subacute
Mudie 2002	30	10	—	—	—
Park 2013	34	33	56.09 (7.22)	51.55 (8.27)	—
Park J 2017	13	13	—	—	—
Park 2018b	7	7	—	—	—
Park 2018a	20	10	59.4 (11.74)	68.6 (13.57)	Early subacute
Park 2020	21	21	67.43 (4.74)	67.57 (3.28)	Chronic
Rangari 2020	35	35	—	—	—
Renald 2016	8	8	—	—	—
Saeys 2012	18	15	61.94 (13.83)	61.07 (9.07)	Late subacute
Sarwar 2019	15	15	—	—	—
Shah 2016	10	12	59.8	55.5	Early subacute

Table 2. Summary characteristics of included studies: participant characteristics *(Continued)*

			(9.58)	(8.79)	
Sharma 2017	13	10	57.23 (7.39)	57 (8.26)	Chronic
Sheehy 2020	33	36	64.9 (15.8)	64.7 (16.2)	Chronic
Shim 2020	17	16	59.65 (16.52)	56 (15.61)	Chronic
Shin 2016	12	12	57.75 (14.03)	59.25 (9.75)	Chronic
Sun 2016	20	20	—	—	—
Thijs 2021	14	15	54.2 (11.46)	49.07 (13.99)	Chronic
Van Criekinge 2020	19	20	61.4 (10.3)	63.6 (14.4)	Early subacute
Varshney 2019	15	15	—	—	—
Verheyden 2009	17	16	55 (11)	62 (14)	Early subacute
Viswaja 2015	30	30	—	—	—
Yoo 2010	28	31	59.61 (18.16)	61.77 (12.58)	Early subacute
Yu 2013	10	10	50 (5.53)	52.64 (4.56)	Chronic

SD: standard deviation

Table 3. Summary characteristics of included studies: intervention characteristics

Study ID	Type of intervention experimental	Type of intervention control group	Length of intervention in weeks	Total numbers of repetitions experimental group	Total numbers of repetitions control group	Total minutes of intervention in the experimental group	Total minutes of intervention in the control group	Total minutes of conventional therapy in the experimental group	Total minutes of conventional therapy in the control group
An 2017	Selective-trunk training	Non-dose-matched therapy	4	3 sessions per week, 4 weeks, 30 minutes each session	0	360	0 (non-dose-matched therapy)	600	600
Bae 2013	Unstable-surface training	Same exercises but on a stable surface	12	30 minutes each session, 5 times a week	30 minutes each session, 5 times a week	1800	1800 (dose-matched therapy)	Not reported	Not reported
Bilek 2020	Electrostimulation	Non-dose-matched therapy	6	5 sessions per week, 6 weeks, 20 minutes each session	0	600	0 (non-dose-matched therapy)	1350	1350
Büyükavcı 2018	Sitting-reaching training	Non-dose-matched therapy	3	2 hours, 5 days per week, 3 weeks	0	900	0 (non-dose-matched therapy)	3000	2700
Cabanas-Valdés 2016	Core-stability training	Non-dose-matched therapy	5	5 weeks, 5 sessions per week, 15 minutes of therapy each session	0	375	0 (non-dose-matched therapy)	1500	1500
Cano-Mañas 2020	Other types of training: video-based trunk training	Non-dose-matched therapy	8	3 sessions per week for 8 weeks, 20 minutes per session	0	480	0 (non-dose-matched therapy)	1680	1680

Table 3. Summary characteristics of included studies: intervention characteristics *(Continued)*

Chan 2015	Electrostimulation and selective-trunk training	Health education	6	5 sessions per week for 6 weeks, 60 minutes per session	0	1800	0 (non-dose-matched therapy)	Not reported	Not reported
Chen 2020	Core-stability training	Same exercises but on a stable surface	8	6 sessions per week, 8 weeks, 40 minutes each session	One session per day, 6 sessions per week for 8 weeks, 40 minutes each session	1440	1440 (dose-matched therapy)	1440	1440
Chitra 2015	Core-stability training	Strengthening training	4	3 sessions per week for 4 weeks, 30 minutes	3 days per week for 4 weeks, 30 minutes	360	360 (dose-matched therapy)	30	30
Choi 2014	Unstable-surface training	Task-oriented training	4	15 minutes each session, 5 sessions per week, 4 weeks	15 minutes per day, 5 days per week for 4 weeks	300	300 (dose-matched therapy)	Not reported	Not reported
Chung 2013	Core-stability training	Non-dose-matched therapy	4	3 sessions per week, 4 weeks, 60 minutes each session	0	720	0 (non-dose-matched therapy)	1200	1200
Chung 2014	Core-stability training	Same exercises but on a stable surface	6	3 sessions per week for 6 weeks, 30 minutes per session	3 sessions per week for 6 weeks, 30 minutes per session	540	540 (dose-matched therapy)	900	900
Dean 1997	Sitting-reaching training	Cognitive exercises	2	10 sessions over 2 weeks, 30 minutes	10 sessions over 2 weeks, 30 minutes	300	300 (dose-matched therapy)	Not reported	Not reported
Dean 2007	Sitting-reaching training	Cognitive exercises	2	10 sessions in 2 weeks	10 sessions in 2 weeks	300	300	Not reported	Not reported

Table 3. Summary characteristics of included studies: intervention characteristics *(Continued)*

							(dose-matched therapy)		
DeLuca 2020	Unstable-surface training	Additional conventional therapy	5	3 sessions per week, for 5 weeks, 45 minutes each session	3 sessions per week for 5 weeks, 45 minutes each session	675	675 (dose-matched therapy)	Not reported	Not reported
De Sèze 2001	Sitting-reaching training	Additional conventional therapy	4	5 sessions per week for 4 weeks, 60 minutes each session	5 sessions per week for 4 weeks, 60 minutes each session	1200	1200 (dose-matched therapy)	2400	2400
Seo 2012	Selective-trunk training	Non-dose-matched therapy	5	5 sessions per week, 5 weeks, 30 minutes	0	750	0 (non-dose-matched therapy)	Not reported	Not reported
Dubey 2018	Selective-trunk training	Additional conventional therapy	6	3 sessions per week, 6 sessions, 60 minutes each session	3 sessions per week, 6 sessions, 60 minutes each session	1080	1080 (dose-matched therapy)	Not reported	Not reported
El-Nashar 2019	Core-stability training	Strengthening training	6	3 sessions per week, 6 weeks, 30 minutes each session	3 sessions per week for 6 weeks, 30 minutes each session	540	540 (dose-matched therapy)	Not reported	Not reported
Fujino 2016	Static inclined-surface training	Horizontal-surface training	1	6 sessions per week, 60 times in each session	6 sessions per week, 60 times in each session	360	360 (dose-matched therapy)	300	300
Fukata 2019	Static inclined-surface training	Horizontal-surface training	1.2	40 times in each session for seven sessions over 8 days, 10 minutes each session	40 times in each session for seven sessions over 8 days, 10 minutes each session	70	70 (dose-matched therapy)	560	560

Table 3. Summary characteristics of included studies: intervention characteristics *(Continued)*

Haruyama 2017	Core-stability training	Additional conventional therapy	4	5 sessions per week for 4 weeks, 20 min	5 sessions per week for 4 weeks, 20 min	400	400 (dose-matched therapy)	2872.5	2617.5
Jung 2014	Weight-shift training	Additional conventional therapy	4	5 sessions per week for 4 weeks, 30 minutes per session	5 sessions per week for 4 weeks, 30 minutes per session	600	600 (dose-matched therapy)	600	600
Jung 2016b	Electrostimulation and weight-shift training	Same exercises but on a stable surface	6	5 sessions per week for 6 weeks, 30 minutes per session	5 sessions per week for 6 weeks, 30 minutes per session	900	900 (dose-matched therapy)	1800	1800
Jung 2016a	Unstable-surface training	Training without electrical stimulation	6	5 sessions per week for 4 weeks, 30 minutes each session	5 sessions per week for 4 weeks, 30 minutes each session	600	600 (dose-matched therapy)	Not reported	Not reported
Jung 2017	Core-stability training	Training without biofeedback	6	5 sessions per week for 6 weeks, 50 minutes each session	5 sessions per week for 6 weeks, 50 minutes each session	1500	1500 (dose-matched therapy)	Not reported	Not reported
Karthikbabu 2011	Unstable-surface training	Same exercises but on a stable surface	3	4 sessions per week for 3 weeks, 60 minutes each session	4 sessions per week for 3 weeks, 60 minutes each session	720	720 (dose-matched therapy)	Not reported	Not reported
Karthikbabu 2018a	Selective-trunk training and unstable-surface training	Additional conventional therapy	6	3 sessions per week for 6 weeks, 60 minutes each session	3 sessions per week for 6 weeks, 60 minutes each session	1080	1080 (dose-matched therapy)	Not reported	Not reported
Karthikbabu 2021	Core-stability training	Additional conventional therapy	6	3 sessions per week for 6 weeks, 60 minutes each session	3 sessions per week for 6 weeks, 60 minutes each session	1080	1080	Not reported	Not reported

Table 3. Summary characteristics of included studies: intervention characteristics *(Continued)*

	and unstable-surface training						(dose-matched therapy)		
Kilinç 2016	Core-stability training	Strengthening training	12	3 sessions per week for 12 weeks, 60 minutes each session	3 sessions per week for 12 weeks, 60 minutes each session	2160	2160 (dose-matched therapy)	Not reported	Not reported
Kim 2011	Core-stability training	Additional conventional therapy	6	5 sessions per week for 6 weeks, 20 minutes each session	5 sessions per week for 6 weeks, 20 minutes per session	300	300 (dose-matched therapy)	600	600
Ko 2016	Core-stability training and electrostimulation	Core-stability training or electrostimulation	3	3 sessions per week for 3 weeks, 20 minutes each session 3 sessions per week for 3 weeks, 20 minutes each session	3 sessions per week for 3 weeks, 20 minutes each session	180	180 (dose-matched therapy)	Not reported	Not reported
Kumar 2011	Selective-trunk training	Non-dose-matched therapy	3	6 sessions per week, for 3 weeks, 45 minutes each session	0	810	0 (non-dose-matched therapy)	Not reported	Not reported
Lee 2012	Unstable-surface training	Non-dose-matched therapy	6	5 sessions per week for 6 weeks, 60 minutes each session	0	540	0 (non-dose-matched therapy)	1800	1800
Lee 2014a	Unstable-surface training	Same exercises but on a stable surface	4	3 sessions per week for 4 weeks, 30 minutes each session	3 sessions per week for 4 weeks, 30 minutes each session	360	360 (dose-matched therapy)	Not reported	Not reported
Lee 2016a	Weight-shift training	Non-dose-matched therapy	4	3 sessions per week for 4 weeks, 30 minutes each session	0	360	0	2700	2700

Table 3. Summary characteristics of included studies: intervention characteristics *(Continued)*

							(non-dose-matched therapy)		
Lee 2017b	Core-stability training	Upper-limb training	.	6 x 5 minutes	6 x 5 minutes	30	30 (dose-matched therapy)	Not reported	Not reported
Lee 2017a	Unstable-surface training	Additional conventional therapy	2	1 session per day, 5 days per week for 2 weeks, 30 minutes each session	1 session per day, 5 days per week for 2 weeks, 30 minutes each session	300	300 (dose-matched therapy)	300	300
Lee MM 2018	Weight-shift training	Non-dose-matched therapy	5	3 sessions per week for 5 weeks, 30 minutes each session.	0	450	0 (non-dose-matched therapy)	1500	1500
Lee 2020a	Selective-trunk training	Upper limb training	6	2 sessions per week for 6 weeks, 30 minutes per session	2 sessions per week for 6 weeks, 30 minutes per session	360	360 (dose-matched therapy)	Not reported	Not reported
Lee 2020b	Core-stability training	Non-dose-matched therapy	6	3 sessions per week for 6 weeks, 20 minutes each session	0	360	0 (non-dose-matched therapy)	Not reported	Not reported
Lee 2014b	Core-stability training	Non-dose-matched therapy	4	3 sessions per week for 4 weeks, 30 minutes each session	0	360	0 (non-dose-matched therapy)	600	600
Liu 2020	Unstable-surface training	Additional conventional therapy	4	1 session per day, 5 sessions per week for 4 weeks, 30 minutes each session	1 session per day, 5 sessions per week for 4 weeks, 30 minutes each session	600	600 (dose-matched therapy)	Not reported	Not reported

Table 3. Summary characteristics of included studies: intervention characteristics *(Continued)*

Marzouk 2019	Selective-trunk training	Non-dose-matched therapy	.	3 sessions per week for 6 weeks; 40 minutes each session	0	720	0 (non-dose-matched therapy)	Not reported	Not reported
Merkert 2011	Unstable-surface training	Non-dose-matched therapy	3	15 sessions, 3 exercises, 30 sec each exercise x 2	Not reported	2700	0 (non-dose-matched therapy)	Not reported	Not reported
Mudie 2002	Selective-trunk training and sitting-reaching training and weight-shift training	Non-dose-matched therapy	2	5 sessions per week for 2 weeks, 30 minutes each session 5 sessions per week for 2 weeks, 30 minutes each session 5 sessions per week for 2 weeks, 30 minutes each session	0	300	0 (non-dose-matched therapy)	Not reported	Not reported
Park 2013	Unstable-surface training	Training without biofeedback	8	3 sessions per week for 8 weeks, 35 minutes each session	3 sessions per week for 8 weeks, 35 minutes each session	840	840 (dose-matched therapy)	Not reported	Not reported
Park J 2017	Other types of training: sitting boxing programme	Neurodevelopmental treatment and proprioceptive neuromuscular facilitation	6	3 sessions per week for 6 weeks, 30 minutes per session	3 sessions per week for 6 weeks, 30 minutes per session	540	540 (dose-matched therapy)	Not reported	Not reported
Park 2018b	Electrostimulation	Training without electrical stimulation		5 sessions per week for 4 weeks, 30 minutes per session	5 sessions per week for 4 weeks, 30 minutes per session	600	600 (dose-matched therapy)	600	600

Table 3. Summary characteristics of included studies: intervention characteristics *(Continued)*

Park 2018a	Electrostimulation and selective-trunk training	Core-muscle strengthening	3	5 days per week for 3 weeks, 30 minutes per session & 5 days per week for 3 weeks, 30 minutes per session	5 days per week for 3 weeks, 30 minutes per session	450	450 (dose-matched therapy)	Not reported	Not reported
Park 2020	Selective-trunk training	Movements out of diagonal pattern	4	20 sessions in 4 weeks, 30 minutes each session	20 sessions in 4 weeks, 30 minutes each session	600	600 (dose-matched therapy)	Not reported	Not reported
Rangari 2020	Unstable-surface training	Same exercises but on a stable surface	6	45-60 minutes each session, 5 times per week for 6 weeks	45-60 minutes per session, 5 times a week for 6 weeks	1350	1350 (dose-matched therapy)	450	450
Renald 2016	Unstable-surface training	Same exercises but on a stable surface	2	6 sessions per week for 2 weeks, 45 minutes each session	6 sessions per week for 2 weeks, 45 minutes each session	540	540 (dose-matched therapy)	Not reported	Not reported
Saeys 2012	Selective-trunk training	Upper-limb training	8	4 sessions per week for 8 weeks, 30 minutes each session	4 sessions per week for 8 weeks, 30 minutes each session	960	960 (dose-matched therapy)	Not reported	Not reported
Sarwar 2019	Unstable-surface training	Same exercises but on a stable surface	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported
Shah 2016	Other types of training: trunk exercises in combination with motor imagery	Additional conventional therapy	3	6 sessions per week for 3 weeks, 90 minutes each day (2 sessions per day)	6 sessions per week for 3 weeks, 90 minutes each day (2 sessions per day)	1620	1620 (dose-matched therapy)	Not reported	Not reported
Sharma 2017	Core-stability training	Training without core training	4	5 sessions per week for 4 weeks, 60 minutes each session	5 sessions per week for 4 weeks,	1200	1200	Not reported	Not reported

Table 3. Summary characteristics of included studies: intervention characteristics *(Continued)*

				60 minutes each session		(dose-matched therapy)		
Sheehy 2020	Sitting-reaching training	Reaching training	4	10 sessions, 30 minutes each session	10 sessions, 30 minutes each session	300	300 (dose-matched therapy)	Not reported	Not reported
Shim 2020	Electrostimulation	Training without electrical stimulation	4	5 sessions per week for 4 weeks, 30 minutes each session	5 sessions per week for 4 weeks, 30 minutes each session	600	600 (dose-matched therapy)	Not reported	Not reported
Shin 2016	Selective-trunk training	Non-dose-matched therapy	4	3 sessions per week for 4 weeks, 20 minutes	0	240	0 (non-dose-matched therapy)	360	360
Sun 2016	Core-stability training	Additional conventional therapy	6	1 session per day, 6 sessions per week for 6 weeks, 60 minutes each session	1 session per day, 6 sessions per week for 6 weeks, 60 minutes each session	2160	2160 (dose-matched therapy)	Not reported	Not reported
Thijs 2021	Selective-trunk training	Non-dose-matched therapy	4	3 sessions per week for 4 weeks, 50 minutes each session	0	600	0 (non-dose-matched therapy)	3 sessions of 30 minutes and 2 hours therapy per week	3 sessions of 30 minutes and 2 hours therapy per week
Van Criekinge 2020	Selective-trunk training	Cognitive exercises	4	4 days per week for 4 weeks, 60 minutes each session	4 days per week for 4 weeks, 60 minutes each session	960	960 (dose-matched therapy)	1200	1200
Varshney 2019	Unstable-surface training	Non-dose-matched therapy	3	4 sessions per week for 3 weeks, 20 minutes each session	0	240	0	Not reported	Not reported

Table 3. Summary characteristics of included studies: intervention characteristics *(Continued)*

							(non-dose-matched therapy)		
Verheyden 2009	Selective-trunk training	Non-dose-matched therapy	5	4 sessions per week for 4 weeks, 30 minutes each session	0	600	0 (non-dose-matched therapy)	2700	2880
Viswaja 2015	Unstable-surface training	Reaching training	4	5 sessions per week for 4 weeks, 30 minutes each session	5 sessions per week for 4 weeks, 30 minutes each session	600	600 (dose-matched therapy)	Not reported	Not reported
Yoo 2010	Core-stability training	Additional conventional therapy	4	3 sessions per week for 4 weeks, 30 minutes each session	3 sessions per week for 4 weeks, 30 minutes each session	360	360 (dose-matched therapy)	360	360
Yu 2013	Core-stability training	Non-dose-matched therapy	4	5 sessions per week for 4 weeks, 30 minutes each session	0	600	0 (non-dose-matched therapy)	Not reported	Not reported

Table 4. Summary characteristics of included studies: outcome measures

Study ID	Primary outcome (activities of daily living)	Secondary outcome
An 2017		Berg Balance Scale
		Timed Up and Go
		Trunk Impairment Scale 1.0
Bae 2013		Trunk Impairment Scale 1.0
Bilek 2020		Brunel Balance Assessment
		Functional ambulation category
		Postural Assessment Scale for Stroke
		Short Form-36
Büyükavcı 2016	Functional independence measurement motor score	Trunk Impairment Scale 1.0
		Berg Balance Scale
		Brunnstrom-upper extremity
		Brunnstrom-lower extremity
Cabanas-Valdés 2016		Trunk Impairment Scale 2.0
		Berg Balance Scale
		Tinetti total
		Barthel Index
		Tinetti gait
		Brunel Balance Assessment
		Spanish version of Postural Assessment Scale for Stroke Patients
		Function in Sitting Test
Cano-Mañas 2020	Barthel Index	Tinetti gait
		Tinetti balance
		Functional Reach Test
		Get up and Go
		European Quality of Life-5 Dimensions–Mobility
		European Quality of Life-5 Dimensions-Personal Care
		European Quality of Life-5 Dimensions–Activities
		European Quality of Life-5 Dimensions-Pain/discomfort
		European Quality of Life-5 Dimensions-Anxiety/ depression

Table 4. Summary characteristics of included studies: outcome measures *(Continued)*

Chan 2015		Trunk Impairment Scale 1.0
Chen 2020		Brunel Balance Assessment Fugl-Meyer Assessment-Lower Extremity
Chitra 2015	Functional independence measure-total	Berg Balance Scale
Choi 2014		Modified Functional Reach Test-Anterior reach (cm)
Chung 2013		Timed up and Go (s)
Chung 2014		Timed up and Go (s)
Dean 1997		Modified Forward reach test-seated (m)
Dean 2007		Modified Forward reach test-seated (m) 10-Meter Walk Test (m/s)
DeLuca 2020		Trunk Impairment Scale 1.0 Berg Balance Scale
De Sèze 2001		Trunk Control Test
Seo 2012		Functional Reach Test (cm) in standing Postural assessment scale for stroke
Dubey 2018	modified Barthel Index	Fugl-Meyer Assessment-Lower Extremity Gait speed (m/s) Trunk Impairment Scale 2.0
El-Nashar 2019		Wolf Motor Function Test Range of motion of shoulder flexion and abduction Trunk Impairment Scale 1.0
Fujino 2016		Trunk Control Test
Fukata 2019	Functional Independence Measure–motor Functional Independence Measure-cognitive	Trunk Impairment Scale 1.0 Trunk Control Test
Haruyama 2017		Timed up and go Functional reach test (standing) Trunk impairment scale 1.0
Jung 2014		Timed Up and Go

Table 4. Summary characteristics of included studies: outcome measures *(Continued)*

	Trunk Impairment Scale 1.0
Jung 2016b	Trunk Impairment Scale 1.0
Jung 2016a	Trunk Impairment Scale 1.0
	10-Meter Walk Test (s)
Jung 2017	Modified Functional Reach Test-Anterior reach (cm)
Karthikbabu 2011	Trunk Impairment Scale 1.0
	Brunel Balance Assessment
	Brunel Balance Assessment–stepping
	Brunel Balance Assessment–standing
	Brunel Balance Assessment-total
Karthikbabu 2018a	Trunk Impairment Scale 2.0
	Stroke Impact Scale 2.0
	Walking speed (m/s)
	Tinetti balance
	Tinetti gait
	Tinetti total
Karthikbabu 2021	Trunk Impairment Scale 1.0
	Activity-Specific Balance Confidence scale
	Weight Bearing Asymmetry
	Trunk strength
Kilinç 2016	Trunk Impairment Scale 1.0
	Berg Balance Scale
	10-Meter Walk Test (s)
	Get up and Go
	Stream-upper extremity
	Stream-lower extremity
Kim 2011	Functional reach in standing (cm)
Ko 2016	Berg Balance Scale
	Trunk Impairment Scale 1.0
	modified Barthel Index
Kumar 2011	Brunel Balance Assessment
	Trunk Impairment Scale 1.0

Table 4. Summary characteristics of included studies: outcome measures *(Continued)*

Lee 2012		Trunk Impairment Scale 1.0
		Modified Functional Reach Test-Anterior reach (cm)
Lee 2014a		Timed Up and Go (s)
		Berg Balance Scale
Lee 2016a		Trunk Impairment Scale 1.0
		Berg Balance Scale
		Timed Up and Go (s)
		Fugl-Meyer Assessment-upper extremity
Lee 2017b		Trunk Impairment Scale 1.0
Lee 2017a	Barthel Index	Functional Ambulation Category
		Berg Balance Scale
		Trunk impairment scale 1.0
Lee MM 2018		Manual function test-total
		Manual function test-upper limb
		Manual function test-hand
		Modified Functional Reach Test-Anterior reach (cm)
Lee 2020a		Fugl-Meyer Assessment-Lower Extremity
		Trunk Impairment Scale 1.0
		6 Minutes Walk Test (m)
Lee 2020b		10-Meter walk test
		Dynamic gait index
		Timed Up and Go test
		Abdominal muscle thickness
		Berg Balance Scale
		Functional Reach Test
Lee 2014b		Timed Up and Go (s)
		Berg Balance Scale
		Walking speed (cm/s)
Liu 2020	Barthel Index	SF-36 bodily pain
		SF-36 general health
		SF-36 Vitality
		SF-36 social functioning

Table 4. Summary characteristics of included studies: outcome measures *(Continued)*

		SF-36 Mental health
		Berg Balance Scale
		Fugl-Meyer Assessment-upper extremity
		Fugl-Meyer Assessment-Lower Extremity
Marzouk 2019		Walking speed (m/s)
Merkert 2011	Barthel Index	Timed up and Go (sec)
		Berg Balance Scale
Mudie 2002	Barthel Index	
Park 2013		Berg Balance Scale
Park J 2017		Berg Balance Scale
		Manual Function Test-total
		10-Meter Walk Test (s)
		Stroke-Specific Quality of Life
Park 2018b		Trunk Impairment Scale 1.0
		Tinetti gait
		Six-minute walk test (m)
Park 2018a	Barthel Index	Berg Balance Scale
		Trunk impairment scale 1.0
Park 2020		Trunk Impairment Scale 1.0
		10-Meter Walk Test (s)
		Gait speed (m/s)
		Berg Balance Scale
Rangari 2020	Barthel Index	Trunk Impairment Scale 1.0
		Brunel Balance Assessment at 1 week and at 1 month
Renald 2016		Trunk Impairment Scale 1.0
Saeys 2012		Trunk Impairment Scale 1.0
		Berg Balance Scale
		Tinetti balance
		Functional ambulation category (FAC)
		Rivermead Motor Assessment Battery-Gross function
		Rivermead Motor Assessment Battery-leg and trunk
		Rivermead Motor Assessment Battery-arm

Table 4. Summary characteristics of included studies: outcome measures *(Continued)*

Sarwar 2019		Trunk Impairment Scale 1.0 Berg Balance Scale
Shah 2016	Barthel Index	Trunk Impairment Scale 1.0 Trunk Control Test Brunel Balance Assessment Brunel Balance Assessment – standing Brunel Balance Assessment-stepping
Sharma 2017	modified Barthel Index	Trunk Impairment Scale 1.0 Wisconsin Gait Scale Tinetti-POMA (balance and gait)
Sheehy 2020		Wolf Motor Function Test Function in Sitting Test Ottawa Sitting Scale Reaching Performance Scale
Shim 2020		Trunk Impairment Scale 1.0 Berg Balance Scale Dynamic Gait Index
Shin 2016		modified Functional Reach Test Timed Up and Go (s) Trunk Impairment Scale 1.0
Sun 2016	modified Barthel Index	Berg Balance Scale
Thijs 2021	Functional Independence Measure modified Barthel Index	Trunk Impairment Scale 10 Metre Walk Test (comfortable and maximum speed) Fugl-Meyer of Lower Extremities Berg Balance Scale Functional Ambulation Category Forward Reach Tone lower extremities Strength trunk and lower extremities
Van Criekinge 2020		Trunk Impairment Scale 1.0
Varshney 2019		Trunk Impairment Scale 1.0
Verheyden 2009		Trunk Impairment Scale 1.0

Table 4. Summary characteristics of included studies: outcome measures *(Continued)*

Viswaja 2015	Trunk Impairment Scale 1.0
Yoo 2010	Trunk Impairment Scale 1.0 Berg Balance Scale Trunk Control Test
Yu 2013	Trunk Impairment Scale 1.0

cm: centimetre
cm/s: centimetre per second
FAC: Functional Ambulation Category
m: metre
m/s: metre per second
POMA: Performance-oriented Mobility Assessment
s: second
SF-36: Short Form-36

Table 5. Summary characteristics of included studies: type of intervention in experimental and control groups

Study ID	Type of intervention: experimental	Type of intervention: control group
An 2017	Selective-trunk training	Non-dose-matched therapy
Bae 2013	Unstable-surface training	Same exercises but on a stable surface
Bilek 2020	Electrostimulation	Non-dose-matched therapy
Büyükavcı 2016	Sitting-reaching training	Non-dose-matched therapy
Cabanas-Valdés 2016	Core-stability training	Non-dose-matched therapy
Cano-Mañas 2020	Other types of training: video-based trunk training	Non-dose-matched therapy
Chan 2015	Electrostimulation and selective-trunk training	Health education
Chen 2020	Core-stability training	Same exercises but on a stable surface
Chitra 2015	Core-stability training	Strengthening training
Choi 2014	Unstable-surface training	Task-oriented training
Chung 2013	Core-stability training	Non-dose-matched therapy
Chung 2014	Core-stability training	Same exercises but on a stable surface
Dean 1997	Sitting-reaching training	Cognitive exercises
Dean 2007	Sitting-reaching training	Cognitive exercises
DeLuca 2020	Unstable-surface training	Additional conventional therapy
De Sèze 2001	Sitting-reaching training	Additional conventional therapy
Seo 2012	Selective-trunk training	Non-dose-matched therapy

Table 5. Summary characteristics of included studies: type of intervention in experimental and control groups *(Continued)*

Dubey 2018	Selective-trunk training	Additional conventional therapy
El-Nashar 2019	Core-stability training	Strengthening training
Fujino 2016	Static inclined-surface training	Horizontal surface training
Fukata 2019	Static inclined-surface training	Horizontal surface training
Haruyama 2017	Core-stability training	Additional conventional therapy
Jung 2014	Weight-shift training	Additional conventional therapy
Jung 2016b	Electrostimulation and weight-shift training	Same exercises but on a stable surface
Jung 2016a	Unstable-surface training	Training without electrical stimulation
Jung 2017	core-stability training	Training without biofeedback
Karthikbabu 2011	Unstable-surface training	Same exercises but on a stable surface
Karthikbabu 2018a	Selective-trunk training and unstable-surface training	Additional conventional therapy
Karthikbabu 2021	Core-stability training and unstable-surface training	Additional conventional therapy
Kilinç 2016	Core-stability training	Strengthening training
Kim 2011	Core-stability training	Additional conventional therapy
Ko 2016	Core-stability training and electrostimulation	Core-stability training or electrostimulation
Kumar 2011	Selective-trunk training	Non-dose-matched therapy
Lee 2012	Unstable-surface training	Non-dose-matched therapy
Lee 2014a	Unstable-surface training	Same exercises but on a stable surface
Lee 2016a	Weight-shift training	Non-dose-matched therapy
Lee 2017b	Core-stability training	Upper limb training
Lee 2017a	Unstable-surface training	Additional conventional therapy
Lee MM 2018	Weight-shift training	Non-dose-matched therapy
Lee 2020a	Selective-trunk training	Upper limb training
Lee 2020b	Core-stability training	Non-dose-matched therapy
Lee 2014b	Core-stability training	Non-dose-matched therapy
Liu 2020	Unstable-surface training	Additional conventional therapy
Marzouk 2019	Selective-trunk training	Non-dose-matched therapy

Table 5. Summary characteristics of included studies: type of intervention in experimental and control groups *(Continued)*

Merkert 2011	Unstable-surface training	Non-dose-matched therapy
Mudie 2002	Selective-trunk training and sitting-reaching training and weight-shift training	Non-dose-matched therapy
Park 2013	Unstable-surface training	Training without biofeedback
Park J 2017	Other types of training: sitting boxing programme	Neurodevelopmental treatment and proprioceptive neuromuscular facilitation
Park 2018b	Electrostimulation	Training without electrical stimulation
Park 2018a	Electrostimulation and selective-trunk training	Core muscle strengthening
Park 2020	Selective-trunk training	Movements out of diagonal pattern
Rangari 2020	Unstable-surface training	Same exercises but on a stable surface
Renald 2016	Unstable-surface training	Same exercises but on a stable surface
Saeys 2012	Selective-trunk training	Upper limb training
Sarwar 2019	Unstable-surface training	Same exercises but on a stable surface
Shah 2016	Other types of training: trunk exercises in combination with motor imagery	Additional conventional therapy
Sharma 2017	Core-stability training	Training without core training
Sheehy 2020	Sitting-reaching training	Reaching training
Shim 2020	Electrostimulation	Training without electrical stimulation
Shin 2016	Selective-trunk training	Non-dose-matched therapy
Sun 2016	Core-stability training	Additional conventional therapy
Thijs 2021	Selective-trunk training	Non-dose-matched therapy
Van Criekinge 2020	Selective-trunk training	Cognitive exercises
Varshney 2019	Unstable-surface training	Non-dose-matched therapy
Verheyden 2009	Selective-trunk training	Non-dose-matched therapy
Viswaja 2015	Unstable-surface training	Reaching training
Yoo 2010	Core-stability training	Additional conventional therapy
Yu 2013	Core-stability training	Non-dose-matched therapy

Table 6. Included studies' funding sources: declarations of interest

Study ID	Funding sources	Conflict of interest

Table 6. Included studies' funding sources: declarations of interest *(Continued)*

An 2017	No funding mentioned	No conflict of interest mentioned
Bae 2013	No funding mentioned	No conflict of interest mentioned
Bilek 2020	The authors affirmed that they had no financial affiliation (including research funding) or involvement with any commercial organisation that had a direct financial interest in any matter included in this manuscript.	The authors affirmed that they had no financial affiliation (including research funding) or involvement with any commercial organisation that had a direct financial interest in any matter included in this manuscript.
Büyükavcı 2016	No financial support	The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.
Cabanas-Valdés 2016	No financial support	The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.
Cano-Mañas 2020	No funding mentioned	The authors declared no conflicts of interest.
Chan 2015	No funding was provided.	The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.
Chen 2020	No funding mentioned	No conflict of interest mentioned
Chitra 2015	No funding mentioned	The authors declared no conflicts of interest.
Choi 2014	No funding mentioned	No conflict of interest mentioned
Chung 2013	No funding mentioned	No conflict of interest mentioned
Chung 2014	No funding mentioned	No conflict of interest mentioned
Dean 1997	Partially funded by the School of Physiotherapy, The University of Sydney, and by financial support from an Australian Postgraduate Award and the Cumberland Burniston Foundation (C Dean)	No conflict of interest mentioned
Dean 2007	Australian Physiotherapy Association Physiotherapy Research Foundation	No conflict of interest mentioned
DeLuca 2020	No funding mentioned	No conflict of interest mentioned
De Sèze 2001	No funding mentioned	No conflict of interest mentioned
Seo 2012	No funding mentioned	No conflict of interest mentioned
Dubey 2018	No sponsorship or funding arrangements	We also declare that there are no conflicts of interest to disclose pertaining to this study.
El-Nashar 2019	No competing interests (financial and non-financial)	We declare that the research was conducted in the absence of any commercial relationships that could be constructed as a potential conflict of interest.

Table 6. Included studies' funding sources: declarations of interest *(Continued)*

Fujino 2016	No financial support was received for this study.	The authors declared no conflicts of interest.
Fukata 2019	This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.	No potential conflict of interest was reported by the authors.
Haruyama 2017	No financial support	The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.
Jung 2014	Supported by Sahmyook University	The authors declared no conflict of interest.
Jung 2016b	Gachon University research fund	No conflict of interest mentioned
Jung 2016a	Gimcheon University Research Grant	No conflict of interest mentioned
Jung 2017	Sahmyook University	The authors had no potential conflicts of interest to declare.
Karthikbabu 2011	This research received no specific grant.	No conflict of interest mentioned
Karthikbabu 2018a	No funding mentioned	No conflict of interest mentioned
Karthikbabu 2021	None Financial benefits to the author	There was no conflict of interest in the study.
Kilinç 2016	No financial payments or other benefits from any commercial entity related to the subject of this article	There was no conflict of interest in this study.
Kim 2011	No funding mentioned	No conflict of interest mentioned
Ko 2016	No funding mentioned	No potential conflict of interest relevant to this article was reported.
Kumar 2011	No funding mentioned	No conflict of interest mentioned
Lee 2012	No funding mentioned	No conflict of interest mentioned
Lee 2014a	No funding mentioned	No conflict of interest mentioned
Lee 2016a	No funding mentioned	No conflict of interest mentioned
Lee 2017b	This research was supported by the Daejeon University research fund (20150).	No conflict of interest mentioned
Lee 2017a	No funding mentioned	There was no interest conflict.
Lee MM 2018	This research was supported by the Daejeon University Fund, 2016.	No conflict of interest mentioned
Lee 2020a	This research was partly supported by National Cheng Kung University Hospital, Taiwan (NCKUH-109001002).	The authors declared that there was no conflict of interest.
Lee 2020b	No funding mentioned	The authors declared that there were no conflicts of interest regarding the publication of this article.

Table 6. Included studies' funding sources: declarations of interest *(Continued)*

Lee 2014b	No funding mentioned	Authors declared that they have no conflicts of interest.
Liu 2020	This research was supported by Natural Science Fund of HunanProvince (2018JJ2358, 2019JJ50544).	The authors declared that they had no conflicts of interest.
Marzouk 2019	Nil financial support	There were no conflicts of interest.
Merkert 2011	No funding mentioned	The corresponding author stated that there were no conflicts of interest.
Mudie 2002	This project was funded by a La Trobe University Health Sciences Faculty Grant No.A33.	No conflict of interest mentioned
Park 2013	No funding mentioned	No conflict of interest mentioned
Park J 2017	Financial disclosure statements have been obtained.	No conflicts of interest have been reported by the authors or by any individuals in control of the content of this article.
Park 2018b	No funding mentioned	No conflict of interest mentioned
Park 2018a	This work was supported by the Soonchunhyang University Research Fund.	No potential conflict of interest relevant to this article was reported.
Park 2020	This research received no external funding.	The authors declared no conflict of interest.
Rangari 2020	The study was self-funded.	The authors declared no conflict of interest.
Renald 2016	No funding mentioned	The authors stated that there were no conflicts of interest.
Saeys 2012	The author(s) received no financial support for the research, authorship, and/or publication of this article.	The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.
Sarwar 2019	No funding mentioned	The authors declared no conflict of interest.
Shah 2016	Funding was nil.	The authors declared no conflict of interest.
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Table 6. Included studies' funding sources: declarations of interest *(Continued)*

		an organisation that holds or has applied for patents relating to the content of the manuscript.
Van Criekinge 2020	This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.	The authors completed the ICMJE Form for Disclosure of Potential Conflicts of Interest and reported no conflicts of interest.
Varshney 2019	The study was self-funded.	Conflict of interest: none
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Yu 2013	No funding mentioned	No conflict of interest mentioned

Table 7. Effect of different therapy approaches

Outcomes		Subgroup difference of different trunk-training therapy approaches	Core-stability training	Electro-stimulation	Selective-trunk training	Static inclined-surface training	Sitting-reaching training	Unstable-surface training	Weight-shift training	Other types of trunk-training
Activities of daily living (primary outcome)	**Non-dose-matched therapy**	P < 0.0001	79 participants (1 RCT) SMD 0.73, 95% CI 0.27 to 1.19)	—	—	—	80 participants (2 RCTs) SMD 2.69, 95% CI 2.00 to 3.39	48 participants (1 RCT) SMD 0.61, 95% CI 0.03 to 1.19	—	48 participants (1 RCT) SMD 0.80, 95% CI 0.21 to 1.39
	Dose-matched therapy	P = 0.007	73 participants (1 RCT) SMD -0.19, 95% CI -0.66 to 0.28	30 participants (1 RCT) SMD 0.30, 95% CI -0.46 to 1.07	56 participants (2 RCTs) SMD 0.39, 95% CI -0.16 to 0.93	28 participants (1 RCT) SMD -0.10, 95% CI -0.85 to 0.64	20 participants (1 RCT) SMD 0.44, 95% CI -0.45 to 1.33	30 participants (1 RCT) SMD -0.63, 95% CI -1.37 to 0.10	—	22 participants (1 RCT) SMD 1.77, 95% CI 0.76 to 2.79
Trunk function	**Non-dose-matched therapy**	P < 0.0001	99 participants (2 RCTs) SMD 1.32, 95% CI 0.87 to 1.76	60 participants (1 RCT) SMD 1.18, 95% CI 0.63 to 1.73	147 participants (6 RCTs) SMD 1.42, 95% CI 1.03 to 1.80	—	64 participants (1 RCT) SMD 8.47, 95% CI 6.88 to 10.06	56 participants (2 RCTs) SMD 2.11, 95% CI 1.40 to 2.81	40 participants (2 RCTs) SMD 0.77, 95% CI 0.11 to 1.43	—
	Dose-matched therapy	P = 0.001	297 participants (8 RCTs) SMD 0.99, 95% CI 0.75 to 1.24	131 participants (5 RCTs) SMD 1.57, 95% CI 1.16 to 1.98	281 participants (8 RCTs) SMD 1.46, 95% CI 1.18 to 1.73	58 participants (2 RCTs) SMD 0.92, 95% CI 0.38 to 1.47	104 participants (4 RCTs) SMD 0.44, 95% CI 0.02 to 0.87	375 participants (11 RCTs) SMD 0.93, 95% CI 0.71 to 1.16	57 participants (2 RCTs) SMD 1.10, 95% CI 0.54 to 1.67	22 participants (1 RCT) SMD 1.38, 95% CI 0.43 to 2.33

Table 7. Effect of different therapy approaches *(Continued)*

Arm-hand function	**Non-dose-matched therapy**	P = 0.11	—	—	—	—	64 participants (1 RCT) SMD 0.55, 95% CI 0.05 to 1.05	—	10 participants (1 RCT) SMD 1.95, 95% CI 0.29 to 3.61	—
	Dose-matched therapy	1 trial	19 participants (1 RCT) SMD 0.76, 95% CI -0.18 to 1.70	—	—	—	—	—	—	—
Arm-hand activity	**Non-dose-matched therapy**	P = 0.10	—	—	—	—	—	—	30 participants (1 RCT) MD 1.00, 95% CI 0.17 to 1.83	26 participants (1 RCT) MD 2.00, 95% CI 1.14 to 2.86
	Dose-matched therapy	P < 0.0001	—	—	33 participants (1 RCT) SMD 0.31, 95% CI -0.38 to 1.00	—	53 participants (1 RCT) SMD -0.46, 95% CI -1.01 to 0.09	—	—	26 participants (1 RCT) SMD 1.72, 95% CI 0.80 to 2.65
Standing balance	**Non-dose-matched therapy**	P < 0.0001	119 participants (3 RCTs) SMD 0.83, 95% CI 0.45 to 1.21	60 participants (1 RCT) SMD -0.88, 95% CI -1.41 to -0.35	61 participants (3 RCTs) SMD 1.28, 95% CI 0.67 to 1.89	—	64 participants (1 RCT) SMD 6.14, 95% CI 4.94 to 7.34	48 participants (1 RCT) SMD 0.32, 95% CI -0.25 to 0.89	10 participants (1 RCT) SMD -1.80, 95% CI -3.40 to -0.20	48 participants (1 RCT) SMD 0.34, 95% CI -0.23 to 0.91
	Dose-matched therapy	P < 0.001	403 participants (8 RCTs)	63 participants (2 RCTs)	171 participants (4 RCTs)	—	—	261 participants (7 RCTs)	—	48 participants (2 RCTS)

Table 7. Effect of different therapy approaches *(Continued)*

			SMD 1.31, 95% CI 1.08 to 1.54	SMD 0.51, 95% CI -0.00 to 1.03	SMD 0.91, 95% CI 0.59 to 1.23			SMD 0.84, 95% CI 0.58 to 1.11		SMD 2.05, 95% CI 1.33 to 2.77
Leg function	**Non-dose-matched therapy**	—	—	—	—	—	64 participants (1 RCT) SMD 0.70, 95% CI 0.39 to 1.01	—	—	—
	Dose-matched therapy	P = 0.002	199 participants (2 RCTs) SMD 1.82, 95% CI 1.48 to 2.15	—	55 participants 2 RCTs) SMD 0.64, 95% CI -0.01 to 1.30	—	—	—	—	—
Walking ability	**Non-dose-matched therapy**	P = 0.35	140 participants (4 RCTs) SMD 0.51, 95% CI 0.17 to 0.85	60 participants (1 RCT) SMD 1.02, 95% CI 0.48 to 1.56	82 participants (3 RCTs) SMD 1.01, 95% CI 0.54 to 1.49	—	—	22 participants (1 RCT) SMD 0.60, 95% CI -0.29 to 1.49	10 participants (1 RCT) SMD 1.31, 95% CI -0.13 to 2.76	48 participants (1 RCT) SMD 0.45, 95% CI -0.12 to 1.03
	Dose-matched therapy	P = 0.06	86 participants (4 RCTs) SMD 1.22, 95% CI 0.74 to 1.69	47 participants (2 RCTs) SMD 0.32, 95% CI -0.26 to 0.89	226 participants (6 RCTs) SMD 0.66, 95% CI 0.38 to 0.93	—	32 participants (2 RCTs) SMD 0.88, 95% CI 0.14 to 1.61	129 participants (4 RCTs) SMD 0.41, 95% CI 0.06 to 0.77	17 participants (1 RCT) SMD 0.27, 95% CI -0.69 to 1.23	26 participants (1 RCT) SMD 1.37, 95% CI 0.50 to 2.24
Quality of life after stroke	**Non-dose-matched therapy**	P = 0.15	—	60 participants (1 RCT) SMD 0.76, 95% CI 0.23 to 1.29	—	—	—	—	—	48 participants (1 RCT) SMD 0.20, 95% CI -0.37 to 0.76

Table 7. Effect of different therapy approaches *(Continued)*

	Dose-matched therapy	P = 0.12	—	—	57 participants (1 RCT) SMD 0.47, 95% CI -0.06 to 1.00	—	—	55 participants (1 RCT) SMD 0.50, 95% CI -0.04 to 1.04	—	26 participants (1 RCT) SMD 1.49, 95% CI 0.61 to 2.38
Barthel Index	**Non-dose-matched therapy**	—	—	—	—	—	—	—	—	—
	Dose-matched therapy	P < 0.0001	51 participants (2 RCTs) MD 0.87, 95% CI -3.68 to 5.43	—	56 participants (2 RCTs) MD 7.12, 95% CI 1.01 to 13.22	—	—	30 participants (1 RCT) MD -5.30, 95% CI -11.13 to 0.53	—	22 participants (1 RCT) MD 29.90, 95% CI 16.67 to 43.13
Trunk Impairment Scale version 1.0	**Non-dose-matched therapy**	P < 0.0001	20 participants (1 RCT) MD 3.50, 95% CI 2.25 to 4.75	—	130 participants (5 RCTs) MD 3.10, 95% CI 2.53 to 3.68	—	—	56 participants (2 RCTs) MD 1.47, 95% CI 1.19 to 1.75	—	—
	Dose-matched therapy	P < 0.001	255 participants (7 RCTs) MD 2.06, 95% CI 1.59 to 2.53	131 participants (5 RCTs) MD 2.90, 95% CI 2.35 to 3.44	168 participants (5 RCTs) MD 1.92, 95% CI 1.54 to 2.30	—	—	273 participants (8 RCTs) MD 1.53, 95% CI 1.16 to 1.89	—	—
Berg Balance Scale	**Non-dose-matched therapy**	P = 0.62	119 participants (3 RCTs) MD 4.62, 95% CI 2.08 to 7.17	—	—	—	—	48 participants (1 RCT) MD 3.10, 95% CI -2.29 to 8.49	—	—

Table 7. Effect of different therapy approaches *(Continued)*

	Dose-matched therapy	P = 0.001	308 participants (5 RCTs) MD 2.11, 95% CI 1.77 to 2.45	63 participants (2 RCTs) MD 0.85, 95% CI -0.57 to 2.28	75 participants (2 RCTs) MD 1.75, 95% CI 0.28 to 3.22	—	—	176 participants (5 RCTs) MD 3.38, 95% CI 2.59 to 4.18	—	26 participants (1 RCT) MD 4.18, 95% CI 2.60 to 5.76
Timed Up and Go Test	**Non-dose-matched therapy**	P < 0.0001	37 participants (2 RCTs) MD -0.93, 95% CI -5.25 to 3.39	—	94 participants (3 RCTs) MD -0.18, 95% CI -0.51 to 0.15	—	—	22 participants (1 RCT) MD 7.10, 95% CI -1.31 to 15.51	10 participants (1 RCT) MD -3.83, 95% CI -4.89 to -2.77	—
	Dose-matched therapy	—	—	—	—	—	—	—	—	—
Tinetti gait scale	**Non-dose-matched therapy**	—	—	—	—	—	—	—	—	—
	Dose-matched therapy	P = 0.17	—	14 participants (1 RCT) MD 1.50, 95% CI 0.38 to 2.63	157 participants (3 RCTs) MD 2.43, 95% CI 1.72 to 3.14	—	—	—	—	—
Death and serious adverse events, including falls	**Non-dose-matched therapy**	Not applicable	Not estimable	—	53 participants (2 RCTs) OR 7.94, 95% CI 0.16 to 400.89	—	—	—	Not estimable	Not estimable
	Dose-matched therapy	Not applicable	Not estimable	Not estimable	Not estimable	Not estimable	85 participants (3 RCTs)	Not estimable	—	Not estimable

Table 7. Effect of different therapy approaches *(Continued)*

				OR 7.39, 95% CI 0.15 to 372.38	

RCT : randomised controlled trials

Table 8. Effect of phase post stroke

Outcomes		Subgroup difference of time post stroke	Early subacute phase	Late subacute phase	Chronic phase
Activities of daily living (primary outcome)	**Non-dose-matched**	P = 0.01	143 participants (2 RCTs) SMD 1.45, 95% CI 1.04 to 1.86	89 participants (2 RCTs) SMD 0.69, 95% CI 0.26 to 1.12	—
	Dose-matched	P = 0.07	150 participants (6 RCTs) SMD 0.21, 95% CI -0.13 to 0.55	30 participants (1 RCT) SMD -0.73, 95% CI -1.47 to 0.02	49 participants (2 RCTs) SMD 0.25, 95% CI -0.32 to 0.82
Trunk function	**Non-dose-matched**	P = 0.08	216 participants (5 RCTs) SMD 1.58, 95% CI 1.23 to 1.93	40 participants (2 RCTs) SMD 0.77, 95% CI 0.11 to 1.43	122 participants (5 RCTs) SMD 1.59, 95% CI 1.16 to 2.02
	Dose-matched	P = 0.10	402 participants (12 RCTs) SMD 1.00, 95% CI 0.78 to 1.21	93 participants (3 RCTs) SMD 1.56, 95% CI 1.08 to 2.05	601 participants (16 RCTs) SMD 1.03, 95% CI 0.85 to 1.21
Arm-hand function	**Non-dose-matched**	P = 0.11	64 participants (1 RCT) SMD 0.55, 95% CI 0.05 to 1.05	10 participants (1 RCT) SMD 1.95, 95% CI 0.29 to 3.61	—
	Dose-matched	—	—	—	19 participants (1 RCT) SMD 0.76, 95% CI -0.18 to 1.70
Arm-hand activity	**Non-dose-matched**	—	—	30 participants (1 RCT) SMD 0.84, 95% CI 0.09 to 1.59	—
	Dose-matched	P = 0.08	—	33 participants (1 RCT) SMD 0.31, 95% CI -0.38 to 1.00	53 participants (1 RCT) SMD -0.46, 95% CI -1.01 to 0.09

Table 8. Effect of phase post stroke *(Continued)*

Standing balance	**Non-dose-matched**	P < 0.0001	163 participants (3 RCTs) SMD 1.95, 95% CI 1.52 to 2.38	106 participants (3 RCTs) SMD 0.20, 95% CI -0.19 to 0.59	82 participants (4 RCTs) SMD 0.58, 95% CI 0.13 to 1.03
	Dose-matched	P < 0.0001	433 participants (9 RCTs) SMD 1.57, 95% CI 1.34 to 1.79	94 participants (3 RCTs) SMD 0.30, 95% CI -0.12 to 0.71	247 participants (6 RCTs) SMD 0.50, 95% CI 0.24 to 0.76
Leg function	**Non-dose-matched**	—	64 participants (1 RCT) SMD 1.10, 95% CI 0.57 to 1.63	—	—
	Dose-matched	P < 0.0001	—	29 participants (1 RCT) SMD -0.29, 95% CI -1.04 to 0.45	45 participants (2 RCTs) SMD 1.67, 95% CI 0.89 to 2.44
Walking ability	**Non-dose-matched**	P = 0.83	79 participants (1 RCT) SMD 0.78, 95% CI 0.32 to 1.24	80 participants (3 RCTs) SMD 0.58, 95% CI 0.12 to 1.03	139 participants (6 RCTs) SMD 0.66, 95% CI 0.31 to 1.02
	Dose-matched	P = 0.003	101 participants (4 RCTs) SMD 0.21, 95% CI -0.18 to 0.61	93 participants (3 RCTs) SMD 1.26, 95% CI 0.80 to 1.71	280 participants (9 RCTs) SMD 0.75, 95% CI 0.50 to 1.00
Quality of life after stroke	**Non-dose-matched**	—	—	48 participants (1 RCT) SMD 0.20, 95% CI -0.37 to 0.76	—
	Dose-matched	—	—	—	85 participants (1 RCT) SMD 0.49, 95% CI 0.02 to 0.95
Barthel Index	**Non-dose-matched**	P = 0.62	79 participants (1 RCT)	96 participants (2 RCTs)	—

Table 8. Effect of phase post stroke *(Continued)*

			MD 13.17, 95% CI 5.30 to 21.04	MD 10.68, 95% CI 4.68 to 16.69	
	Dose-matched	P = 0.05	102 participants (4 RCTs) MD -2.49, 95% CI -5.25 to 0.28	—	49 participants (2 RCTs) MD 2.44, 95% CI -1.72 to 6.60
Trunk Impairment Scale version 1.0	**Non-dose-matched**	P = 0.008	112 participants (3 RCTs) MD 3.62, 95% CI 3.42 to 3.83	10 participants (1 RCT) MD 1.80, 95% CI 0.51 to 3.09	110 participants (4 RCTs) MD 3.07, 95% CI 2.43 to 3.71
	Dose-matched	P < 0.0001	258 participants (8 RCTs) MD 2.91, 95% CI 2.33 to 3.49	93 participants (3 RCTs) MD 3.18, 95% CI 2.42 to 3.95	412 participants (13 RCTs) MD 1.91, 95% CI 1.64 to 2.19
Berg Balance Scale	**Non-dose-matched**	P < 0.0001	143 participants (2 RCTs) MD 13.36, 95% CI 12.33 to 14.39	58 participants (2 RCTs) MD -1.74, 95% CI -2.96 to -0.53	73 participants (3 RCTs) MD 1.82, 95% CI 0.46 to 3.19
	Dose-matched	P < 0.0001	352 participants (6 RCTs) MD 4.17, 95% CI 3.69 to 4.65	63 participants (2 RCTs) MD 3.44, 95% CI -0.98 to 7.86	113 participants (4 RCTs) MD 0.29, 95% CI -0.11 to 0.69
Timed Up and Go Test	**Non-dose-matched**	P = 0.03	—	80 participants (3 RCTs) MD -0.52, 95% CI -0.82 to -0.22	90 participants (4 RCTs) MD 1.12, 95% CI -0.36 to 2.59
	Dose-matched	P = 0.002	—	32 participants (1 RCT) MD 12.34, 95% CI 3.97 to 20.71	47 participants (3 RCTs) MD -1.11, 95% CI -3.22 to 0.99
Death and serious adverse events, including falls	**Non-dose-matched**	Not applicable	—	Not estimable	73 participants (3 RCTs) OR 3.44, 95% CI 0.13 to 91.79

Table 8. Effect of phase post stroke *(Continued)*

	Dose-matched	Not applicable	170 participants (6 RCTs) OR 7.94, 95% CI 0.16 to 400.89)	Not estimable	Not estimable

RCT : randomised controlled trials

Table 9. Overview summary of findings sensitivity analysis

Outcomes		**Experimental training vs control group**	**Sensitivity analysis random-effects model, overall effect**	**Sensitivity analysis excluding trials with high risk of bias on five ROB domains, overall effect**	**Sensitivity analysis excluding trials with calculated change scores, overall effect**
Activities of daily living (primary outcome)	**Non-dose-matched**	283 participants (5 RCTs) SMD 1.39, 95% CI 0.28 to 2.51 Grade ⊕◯◯◯ Very low	283 participants (5 RCTs) SMD 1.28, 95% CI 0.16 to 2.41 Grade ⊕◯◯◯ Very low	177 participants (3 RCTs) SMD 1.19, 95% CI 0.81 to 1.56 Grade ⊕◯◯◯ Very low	191 participants (3 RCTs) SMD 0.73, 95% CI 0.49 to 1.08 Grade ⊕◯◯◯ Very low
	Dose-matched	229 participants (9 RCTs) SMD 0.10, 95% CI -0.17 to 0.37 Grade ⊕◯◯◯ Very low	229 participants (9 RCTs) SMD 0.16, 95% CI -0.28 to 0.60 Grade ⊕◯◯◯ Very low	149 participants (6 RCTs) SMD 0.19, 95% CI -0.15 to 0.52 Grade ⊕◯◯◯ Very low	176 participants (7 RCTs) SMD 0.08, 95% CI -0.23 to 0.38 Grade ⊕◯◯◯ Very low
Trunk function	**Non-dose-matched**	466 participants (14 RCTs) SMD 1.46, 95% CI 1.26 to 1.71 Grade ⊕◯◯◯ Very low	466 participants (14 RCTs) SMD 2.08, 95% CI 1.38 to 2.79 Grade ⊕◯◯◯ Very low	368 participants (9 RCTs) SMD 1.37, 95% CI 1.12 to 1.62 Grade ⊕◯◯◯ Very low	313 participants (9 RCTs) SMD 1.32, 95% CI 1.07 to 1.57 Grade ⊕◯◯◯ Very low
	Dose-matched	1217 participants (36 RCTs)	1217 participants (36 RCTs)	650 participants (21 RCTs)	846 participants (25 RCTs)

Table 9. Overview summary of findings sensitivity analysis *(Continued)*

		SMD 1.03, 95% CI 0.91 to 1.16 Grade ⊕◯◯◯ Very low	SMD 1.15, 95% CI 0.89 to 1.40 Grade ⊕◯◯◯ Very low	SMD 1.19, 95% CI 1.01 to 1.37 Grade ⊕◯◯◯ Very low	SMD 1.13, 95% CI 0.98 to 1.29 Grade ⊕◯◯◯ Very low
Arm-hand function	**Non-dose-matched**	74 participants (2 RCTs) SMD 0.67, 95% CI 0.19 to 1.15 Grade ⊕⊕◯◯ Low	74 participants (2 RCTs) SMD 1.02, 95% CI -0.27 to 2.31 Grade ⊕⊕◯◯ Low	64 participants (1 RCT) SMD 0.55, 95% CI 0.05 to 1.05 Grade ⊕⊕◯◯ Low	64 participants (1 RCT) SMD 0.55, 95% CI 0.05 to 1.05 Grade ⊕⊕◯◯ Low
	Dose-matched	19 participants (1 RCT) SMD 0.76, 95% CI -0.18 to 1.70 Grade ⊕⊕◯◯ Low	19 participants (1 RCT) SMD 0.76, 95% CI -0.18 to 1.70 Grade ⊕⊕◯◯ Low	19 participants (1 RCT) SMD 0.76, 95% CI -0.18 to 1.70 Grade ⊕⊕◯◯ Low	29 participants (2 RCTs) SMD 1.05, 95% CI 0.23 to 1.87 Grade ⊕⊕◯◯ Low
Arm-hand activity	**Non-dose-matched**	30 participants (1 RCT) SMD 0.84, 95% CI 0.09 to 1.59 Grade ⊕◯◯◯ Very low	30 participants (1 RCT) SMD 0.84, 95% CI 0.09 to 1.59 Grade ⊕◯◯◯ Very low	30 participants (1 RCT) SMD 0.84, 95% CI 0.09 to 1.59 Grade ⊕◯◯◯ Very low	30 participants (1 RCT) SMD 0.84, 95% CI 0.09 to 1.59 Grade ⊕◯◯◯ Very low
	Dose-matched	112 participants (3 RCTs) SMD 0.17, 95% CI -0.21 to 0.56 Grade ⊕◯◯◯ Very low	112 participants (3 RCTs) SMD 0.48, 95% CI -0.68 to 1.63 Grade ⊕◯◯◯ Very low	86 participants (2 RCTs) SMD -0.16, 95% CI -0.59 to 0.27 Grade ⊕◯◯◯ Very low	112 participants (3 RCTs) SMD 0.17, 95% CI -0.21 to 0.56 Grade ⊕◯◯◯ Very low
Standing balance	**Non-dose-matched**	410 participants (11 RCTs) SMD 0.57, 95% CI 0.35 to 0.79	410 participants (11 RCTs) SMD 1.05, 95% CI 0.15 to 1.94	300 participants (7 RCTs) SMD 0.72, 95% CI 0.45 to 1.00	512 participants (14 RCTs) SMD 0.59, 95% CI 0.40 to 0.77

Table 9. Overview summary of findings sensitivity analysis *(Continued)*

		Grade ⊕◯◯◯ Very low	Grade ⊕◯◯◯ Very low	Grade ⊕◯◯◯ Very low	Grade ⊕◯◯◯ Very low
	Dose-matched	917 participants (22 RCTs) SMD 1.00, 95% CI 0.86 to 1.15 Grade ⊕◯◯◯ Very low	917 participants (22 RCTs) SMD 1.03, 95% CI 0.60 to 1.46 Grade ⊕◯◯◯ Very low	254 participants (9 RCTs) SMD 0.87, 95% CI 0.60 to 1.14 Grade ⊕◯◯◯ Very low	232 participants (7 RCTs) SMD 0.98, 95% CI 0.70 to 1.27 Grade ⊕◯◯◯ Very low
Leg function	**Non-dose-matched**	64 participants (1 RCT) SMD 1.10, 95% CI 0.57 to 1.63 Grade ⊕◯◯◯ Very low	64 participants (1 RCT) SMD 1.10, 95% CI 0.57 to 1.63 Grade ⊕◯◯◯ Very low	64 participants (1 RCT) SMD 1.10, 95% CI 0.57 to 1.63 Grade ⊕◯◯◯ Very low	64 participants (1 RCT) SMD 1.10, 95% CI 0.57 to 1.63 Grade ⊕◯◯◯ Very low
	Dose-matched	254 participants (4 RCTs) SMD 1.57, 95% CI 1.28 to 1.87 Grade ⊕◯◯◯ Very low	254 participants (4 RCTs) SMD 1.51, 95% CI 0.05 to 2.94 Grade ⊕◯◯◯ Very low	74 participants (3 RCTs) SMD 0.65, 95% CI 0.11 to 1.18 Grade ⊕◯◯◯ Very low	74 participants (3 RCTs) SMD 0.65, 95% CI 0.11 to 1.18 Grade ⊕◯◯◯ Very low
Walking ability	**Non-dose-matched**	383 participants (11 RCTs) SMD 0.73, 95% CI 0.52 to 0.94 Grade ⊕⊕◯◯ Low	383 participants (11 RCTs) SMD 0.73, 95% CI 0.46 to 0.99 Grade ⊕⊕◯◯ Low	309 participants (8 RCTs) SMD 0.77, 95% CI 0.53 to 1.00 Grade ⊕⊕⊕◯ Moderate	209 participants (7 RCTs) SMD 0.80, 95% CI 0.51 to 1.09 Grade ⊕⊕⊕◯ Moderate
	Dose-matched	535 participants (19 RCTs) SMD 0.69, 95% CI 0.51 to 0.87	535 participants (19 RCTs) SMD 0.74, 95% CI 0.47 to 1.01	279 participants (11 RCTs) SMD 0.79, 95% CI 0.53 to 1.04	392 participants (13 RCTs) SMD 0.78, 95% CI 0.56 to 0.99

Table 9. Overview summary of findings sensitivity analysis *(Continued)*

		Grade ⊕⊕◯◯ Low	Grade ⊕⊕◯◯ Low	Grade ⊕⊕⊕◯ Moderate	Grade ⊕⊕⊕◯ Moderate
Quality of life after stroke	**Non-dose-matched**	108 participants (2 RCTs) SMD 0.50, 95% CI 0.11 to 0.89 Grade ⊕⊕◯◯ Low	108 participants (2 RCTs) SMD 0.49, 95% CI -0.06 to 1.04 Grade ⊕⊕◯◯ Low	108 participants (2 RCTs) SMD 0.50, 95% CI 0.11 to 0.89 Grade ⊕⊕◯◯ Low	—
	Dose-matched	111 participants (2 RCTs) SMD 0.70, 95% CI 0.29 to 1.11 Grade ⊕◯◯◯ Very low	111 participants (2 RCTs) SMD 0.92, 95% CI -0.06 to 1.89 Grade ⊕◯◯◯ Very low	—	111 participants (2 RCTs) SMD 0.70, 95% CI 0.29 to 1.11 Grade ⊕◯◯◯ Very low
Barthel Index	**Non-dose-matched**	209 participants (4 RCTs) MD 11.58, 95% CI 6.80 to 16.35 Grade ⊕◯◯◯ Very low	209 participants (4 RCTs) MD 11.58, 95% CI 6.80 to 16.35 Grade ⊕◯◯◯ Very low	113 participants (2 RCTs) MD 13.11, 95% CI 5.25 to 20.97 Grade ⊕⊕◯◯ Low	127 participants (2 RCTs) MD 13.15, 95% CI 6.57 to 19.73 Grade ⊕⊕◯◯ Low
	Dose-matched	151 participants (6 RCTs) MD 2.21, 95% CI -0.82 to 5.25 Grade ⊕⊕◯◯ Low	151 participants (6 RCTs) MD 5.89, 95% CI -1.73 to 13.51 Grade ⊕⊕◯◯ Low	101 participants (4 RCTs) MD -1.55, 95% CI -3.96 to 0.85 Grade ⊕◯◯◯ Very low	98 participants (4 RCTs) MD -1.67, 95% CI -4.34 to 1,00 Grade ⊕⊕◯◯ Low
Trunk Impairment Scale version 1.0	**Non-dose-matched**	280 participants (10 RCTs) MD 2.88, 95% CI 2.72 to 3.04 Grade ⊕◯◯◯ Very low	280 participants (10 RCTs) MD 2.94, 95% CI 1.96 to 3.92 Grade ⊕◯◯◯ Very low	194 participants (6 RCTs) MD 3.59, 95% CI 3.39 to 3.78 Grade ⊕◯◯◯	204 participants (7 RCTs) MD 2.90, 95% CI 2.44 to 3.35 Grade ⊕◯◯◯ Very low

Table 9. Overview summary of findings sensitivity analysis *(Continued)*

				Very low	
	Dose-matched	883 participants (26 RCTs) MD 1.87, 95% CI 1.66 to 2.08 Grade ⊕◯◯◯ Very low	883 participants (26 RCTs) MD 2.33, 95% CI 1.73 to 2.94 Grade ⊕◯◯◯ Very low	352 participants (13 RCTs) MD 2.49, 95% CI 2.13 to 2.85 Grade ⊕◯◯◯ Very low	516 participants (16 RCTs) MD 2.90, 95% CI 2.56 to 3.24 Grade ⊕◯◯◯ Very low
Modified Functional Reach test	**Non-dose-matched**	82 participants (3 RCTs) MD 2.17, 95% CI 1.03 to 3.30 Grade ⊕◯◯◯ Very low	82 participants (3 RCTs) MD 5.99, 95% CI 0.21 to 11.77 Grade ⊕◯◯◯ Very low	54participants (2 RCTs) MD 1.77, 95% CI 0.61 to 2.93 Grade ⊕◯◯◯ Very low	54 participants (2 RCTs) MD 1.77, 95% CI 0.61 to 2.93 Grade ⊕◯◯◯ Very low
	Dose-matched	112 participants (4 RCTs) MD 0.13, 95% CI 0.10 to 0.16 Grade ⊕◯◯◯ Very low	112 participants (4 RCTs) MD 0.17, 95% CI -0.00 to 0.33 Grade ⊕◯◯◯ Very low	74 participants (3 trials) MD 0.13, 95% CI 0.10 to 0.16 Grade ⊕◯◯◯ Very low	Grade ⊕◯◯◯ Very low
Berg Balance Scale	**Non-dose-matched**	270 participants (7 RCTs) MD 5.75, 95% CI 5.06 to 6.43 Grade ⊕◯◯◯ Very low	270 participants (7 RCTs) MD 4.76, 95% CI -1.55 to 11.06 Grade ⊕◯◯◯ Very low	212 participants (5 RCTs) MD 9.23, 95% CI 8.40 to 10.06 Grade ⊕◯◯◯ Very low	250 participants (6 RCTs) MD 0.67, 95% CI -0.24 to 1.59 Grade ⊕◯◯◯ Very low
	Dose-matched	647 participants (15 RCTs)	647 participants (15 RCTs)	138 participants (5 RCTs)	286 participants (9 RCTs)

Table 9. Overview summary of findings sensitivity analysis *(Continued)*

		MD 2.22, 95% CI 1.93 to 2.51 Grade ⊕◯◯◯ Very low	MD 3.31, 95% CI 1.50 to 5.12 Grade ⊕◯◯◯ Very low	MD 0.33, 95% CI -0.07 to 0.73 Grade ⊕◯◯◯ Very low	MD 0.60, 95% CI 0.22 to 0.98 Grade ⊕◯◯◯ Very low
Timed Up and Go Test	**Non-dose-matched**	170 participants (7 RCTs) MD -0.46, 95% CI -0.75 to -0.17 Grade ⊕◯◯◯ Very low	170 participants (7 RCTs) MD 0.34, 95% CI -2.17 to 2.85 Grade ⊕◯◯◯ Very low	127 participants (4 RCTs) MD -0.19, 95% CI -0.50 to 0.11 Grade ⊕◯◯◯ Very low	122 participants (6 RCTs) MD -2.05, 95% CI -2.90 to -1.19 Grade ⊕◯◯◯ Very low
	Dose-matched	99 participants (5 RCTs) MD -0.27, 95% CI -2.24 to 1.70 Grade ⊕◯◯◯	99 participants (5 RCTs) MD 0.31, 95% CI -4.49 to 5.12 Grade ⊕◯◯◯ Very low	66 participants (3 RCTs) MD 0.15, 95% CI -1.96 to 2.27 Grade ⊕◯◯◯ Very low	62 participants (3 RCTs) MD -0.16, 95% CI -2.28 to 1.97 Grade ⊕◯◯◯ Very low
Tinetti Gait	**Non-dose-matched**	146 participants (3 RCTs) MD 1.90, 95% CI 0.96 to 2.84 Grade ⊕⊕◯◯ Low	146 participants (3 RCTs) MD 0.90, 95% CI 0.96 to 2.84 Grade ⊕⊕◯◯ Low	—	—
	Dose-matched	171 participants (4 RCTs) MD 2.16, 95% CI 1.56 to 2.76 Grade ⊕⊕◯◯ Low	171 participants (4 RCTs) MD 2.26, 95% CI 1.16 to 3.37 Grade ⊕⊕◯◯ Low	—	—

Table 9. Overview summary of findings sensitivity analysis *(Continued)*

Ten-Meter Walk Test	**Non-dose-matched**	49 participants (2 RCTs) MD 0.06, 95% CI -0.01 to 0.13 Grade ⊕◯◯◯ Very low	49 participants (2 RCTs) MD 0.07, 95% CI -0.18 to 0.33 Grade ⊕◯◯◯ Very low	49 participants (2 RCTs) MD 0.06, 95% CI -0.01 to 0.13 Grade ⊕◯◯◯ Very low	29 participants (1 RCT) MD 0.06, 95% CI -0.01 to 0.13 Grade ⊕◯◯◯ Very low
	Dose-matched	97 participants (4 RCTs) MD 0.32, 95% CI 0.01 to 0.62 Grade ⊕◯◯◯ Very low	97 participants (4 RCTs) MD 2.08, 95% CI 0.06 to 4.09 Grade ⊕◯◯◯ Very low	31 participants (2 RCTs) MD 0.23, 95% CI -0.08 to 0.53 Grade ⊕◯◯◯ Very low	55 participants (3 RCTs) MD 0.28, 95% CI -0.02 to 0.59 Grade ⊕◯◯◯ Very low
Death and serious adverse events, including falls	**Non-dose-matched**	201 participants (6 RCTs) OR 7.94, 95% CI 0.16 to 400.89 Grade ⊕◯◯◯ Very low	201 participants (6 RCTs) OR 3.44, 95% CI 0.13 to 91.79 Grade ⊕◯◯◯ Very low	151 participants (5 RCTs) OR 7.94, 95% CI 0.16 to 400.89 Grade ⊕◯◯◯ Very low	151 participants (5 RCTs) OR 7.94, 95% CI 0.16 to 400.89 Grade ⊕◯◯◯ Very low
	Dose-matched	381 participants (10 RCTs) OR 7.39, 95% CI 0.15 to 372.38 Grade ⊕◯◯◯ Very low	381 participants (10 RCTs) OR 3.55, 95% CI 0.12 to 105.82 Grade ⊕◯◯◯ Very low	224 participants (7 RCTs) OR 7.39, 95% CI 0.15 to 372.38 Grade ⊕◯◯◯ Very low	381 participants (10 RCTs) OR 7.39, 95% CI 0.15 to 372.38 Grade ⊕◯◯◯ Very low

*The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the relative effect of the intervention (and its 95% CI).

CI: confidence interval; **OR:** odds ratio; **RCT:** randomised controlled trials; **ROB:** Risk of bias; **SD:** standard deviation; **SMD:** standardised mean differences

Table 10. Meta-regression

Potential moderator		Activities of daily living	Trunk function	Standing balance	Walking ability
		P value	P value	P value	P value
Study quality		0.1809	0.8629	0.9752	0.6939
Year of publication		0.7265	0.0518	0.3179	0.6312
Length of intervention in weeks		0.1251	0.8795	0.3691	0.0874
Age of participants intervention group		0.2589	0.6335	0.8254	0.8108
Age of participants control group		0.6161	0.3216	0.2937	0.8896
Time post stroke intervention group		0.9450	0.6152	0.4992	0.5584
Time post stroke control group		0.4574	0.5848	0.5264	0.5868
Time post stroke complete group		0.5687	0.8156	0.9044	0.8776
Phase post stroke:	chronic phase	0.1394	0.5298	0.6190	0.5856
	early subacute phase	0.1244	0.7021	0.537	0.6589
	late subacute phase	0.0958	0.8987	0.1434	0.3738
Amount of study therapy intervention group		0.0942	0.2097	0.4126	0.7105
Amount of study therapy control group		0.1630	0.7780	0.3831	0.3831
Amount of conventional therapy intervention group		0.3153	0.3360	0.8678	0.6821
Amount of conventional therapy control group		0.3132	0.4192	0.7873	0.7000
Difference in study therapy between groups (minutes of study training in experimental group minus minutes of study training in the control group)		0.6410	0.0476*	0.7973	0.6994
Difference between conventional therapy between groups (minutes of conventional training in experimental group minus minutes of conventional training in the control group)		0.1916	0.3613	0.4403	0.5888
Pre-intervention outcome intervention group		0.2780	0.604	0.1888	0.2001
Pre-intervention outcome control group		0.1886	0.6636	0.1562	0.1976
Difference pre-intervention outcome between groups		0.0597	0.9191	0.1981	0.7784
Publication bias		Test for funnel plot asymmetry: z = -2.5274, P = 0.0115*	Test for funnel plot asymmetry: Z = 6.5306, P < 0.0001*	Test for funnel plot asymmetry: Z = 5.7331, P < 0.0001*	Test for funnel plot asymmetry: Z = 1.6478, P = 0.0994

*P < 0.05

APPENDICES

Appendix 1. CENTRAL search strategy

ID Search Hits
#1 MeSH descriptor: [Cerebrovascular Disorders] this term only
#2 MeSH descriptor: [Basal Ganglia Cerebrovascular Disease] explode all trees
#3 MeSH descriptor: [Brain Ischemia] explode all trees
#4 MeSH descriptor: [Brain Infarction] this term only
#5 MeSH descriptor: [Brain Stem Infarctions] this term only
#6 MeSH descriptor: [Cerebral Infarction] this term only
#7 MeSH descriptor: [Infarction, Anterior Cerebral Artery] this term only
#8 MeSH descriptor: [Infarction, Middle Cerebral Artery] this term only
#9 MeSH descriptor: [Infarction, Posterior Cerebral Artery] this term only
#10 MeSH descriptor: [Ischemic Attack, Transient] this term only
#11 MeSH descriptor: [Carotid Artery Diseases] this term only
#12 MeSH descriptor: [Carotid Artery Thrombosis] this term only
#13 MeSH descriptor: [Carotid Stenosis] this term only
#14 MeSH descriptor: [Cerebral Arterial Diseases] this term only
#15 MeSH descriptor: [Intracranial Arteriosclerosis] this term only
#16 MeSH descriptor: [Intracranial Arteriovenous Malformations] explode all trees
#17 MeSH descriptor: [Intracranial Embolism and Thrombosis] explode all trees
#18 MeSH descriptor: [Intracranial Hemorrhages] this term only
#19 MeSH descriptor: [Cerebral Hemorrhage] this term only
#20 MeSH descriptor: [Cerebral Intraventricular Hemorrhage] this term only
#21 MeSH descriptor: [Intracranial Hemorrhage, Hypertensive] this term only
#22 MeSH descriptor: [Subarachnoid Hemorrhage] this term only
#23 MeSH descriptor: [Stroke] this term only
#24 MeSH descriptor: [Hemorrhagic Stroke] this term only
#25 MeSH descriptor: [Ischemic Stroke] explode all trees
#26 MeSH descriptor: [Vasospasm, Intracranial] this term only
#27 MeSH descriptor: [Stroke Rehabilitation] this term only
#28 (stroke or poststroke or post-stroke or cerebrovasc* or (cerebr* near/3 vasc*) or CVA* or apoplectic or apoplex* or (transient near/3 isch?emic near/3 attack) or tia* or SAH or AVM or ESUS or ICH or (cerebral small vessel near/3 disease*)):ti,ab,kw
#29 ((cerebr* or cerebell* or arteriovenous or vertebrobasil* or interhemispheric or hemispher* or intracran* or intracerebral or infratentorial or supratentorial or MCA* or ((anterior or posterior) near/3 circulat*) or lenticulostriate or ((basilar or brachial or vertebr*) near/3 arter*)) near/3 (disease or damage* or disorder* or disturbance or dissection or syndrome or arrest or accident or lesion or vasculopathy or insult or attack or injury or insufficiency or malformation or obstruct* or anomal*)):ti,ab,kw
#30 ((cerebr* or cerebell* or arteriovenous or vertebrobasil* or interhemispheric or hemispher* or intracran* or corpus callosum or intracerebral or intracortical or intraventricular or periventricular or posterior fossa or infratentorial or supratentorial or MCA* or ((anterior or posterior) near/3 circulation) or basal ganglia or ((basilar or brachial or vertebr*) near/3 arter*) or space-occupying or brain ventricle* or lacunar or cortical or ocular) near/3 (isch?emi* or infarct* or thrombo* or emboli* or occlus* or hypoxi* or vasospasm or obstruct* or vasoconstrict*)):ti,ab,kw
#31 ((cerebr* or cerebell* or vertebrobasil* or interhemispheric or hemispher* or intracran* or corpus callosum or intracerebral or intracortical or intraventricular or periventricular or posterior fossa or infratentorial or supratentorial or MCA* or ((anterior or posterior) near/3 circulation) or basal ganglia or ((basilar or brachial or vertebr*) near/3 arter*) or space-occupying or brain ventricle* or subarachnoid* or arachnoid*) near/3 (h?emorrhag* or h?ematom* or bleed*)):ti,ab,kw
#32 ((carotid or cerebr* or cerebell* or intracranial or ((basilar or brachial or vertebr*) near/3 arter*)) near/3 (aneurysm or malformation* or block* or dysplasia or disease* or bruit or injur* or narrow* or obstruct* or occlusion or constriction or presclerosis or scleros* or stenos* or atherosclero* or arteriosclero* or plaque* or thrombo* or embol* or arteriopathy)):ti,ab,kw
#33 MeSH descriptor: [Hemiplegia] this term only
#34 MeSH descriptor: [Paresis] this term only
#35 MeSH descriptor: [Gait Disorders, Neurologic] explode all trees
#36 (hemipleg* or hemipar* or paresis or paraparesis or paretic):ti,ab,kw
#37 {or #1-#36}
#38 MeSH descriptor: [Torso] explode all trees
#39 MeSH descriptor: [Abdominal Muscles] explode all trees
#40 MeSH descriptor: [Back Muscles] explode all trees

#41 MeSH descriptor: [Pectoralis Muscles] this term only
#42 MeSH descriptor: [Respiratory Muscles] explode all trees
#43 (trunk or truncal or thorax or thoracic or torso or diaphragm* or intercostal or pectoral* or ((rib or chest) near/3 (cavity or cage)) or pelvi* or abdom* or perine* or peritonial or (core near/3 stabil*)):ti,ab,kw
#44 (back or erector spinae or spinal erector* or sacrospinal* or latissimus dorsi or levator scapulae or multifidus or paraspinal or trapezius):ti,ab,kw
#45 {or #38-#44}
#46 MeSH descriptor: [Physical Therapy Modalities] explode all trees
#47 MeSH descriptor: [Occupational Therapy] this term only
#48 MeSH descriptor: [Physical Therapy Specialty] this term only
#49 MeSH descriptor: [Physical and Rehabilitation Medicine] this term only
#50 MeSH descriptor: [Rehabilitation] this term only
#51 MeSH descriptor: [Neurological Rehabilitation] explode all trees
#52 MeSH descriptor: [Telerehabilitation] this term only
#53 MeSH descriptor: [Movement] this term only
#54 MeSH descriptor: [Locomotion] this term only
#55 MeSH descriptor: [Running] explode all trees
#56 MeSH descriptor: [Swimming] this term only
#57 MeSH descriptor: [Walking] this term only
#58 MeSH descriptor: [Dependent Ambulation] this term only
#59 MeSH descriptor: [Gait] explode all trees
#60 MeSH descriptor: [Motor Activity] this term only
#61 MeSH descriptor: [Exercise] explode all trees
#62 MeSH descriptor: [Sports] explode all trees
#63 (exercis* or train* or condition* or strengthen* or rehab* or stabili*):ti,ab,kw
#64 {or #46-#63
#65 #37 AND #45 AND #64

Appendix 2. MEDLINE Ovid search strategy

1. cerebrovascular disorders/ or exp basal ganglia cerebrovascular disease/ or brain ischemia/ or ischemic attack, transient/ or vertebrobasilar insufficiency/ or carotid artery diseases/ or carotid artery injuries/ or carotid artery thrombosis/ or carotid stenosis/ or carotid artery, internal, dissection/ or vertebral artery dissection/ or intracranial arterial diseases/ or cerebral arterial diseases/ or intracranial aneurysm/ or intracranial arteriosclerosis/ or intracranial arteriovenous malformations/ or "exp intracranial embolism and thrombosis"/ or intracranial hemorrhages/ or cerebral hemorrhage/ or exp basal ganglia hemorrhage/ or cerebral intraventricular hemorrhage/ or intracranial hemorrhage, hypertensive/ or subarachnoid hemorrhage/ or stroke/ or brain infarction/ or brain stem infarctions/ or cerebral infarction/ or infarction, anterior cerebral artery/ or infarction, middle cerebral artery/ or infarction, posterior cerebral artery/ or hemorrhagic stroke/ or exp ischemic stroke/ or vasospasm, intracranial/
2. stroke rehabilitation/
3. (stroke or poststroke or post-stroke or cerebrovasc$ or (cerebr$ adj3 vasc$) or CVA$ or apoplectic or apoplex$ or (transient adj3 isch?emic adj3 attack) or tia$ or SAH or AVM or (cerebral small vessel adj3 disease)).tw.
4. ((cerebr$ or cerebell$ or arteriovenous or vertebrobasil$ or interhemispheric or hemispher$ or intracran$ or intracerebral or infratentorial or supratentorial or MCA$ or ((anterior or posterior) adj3 circulat$) or lenticulostriate or ((basilar or brachial or vertebr$) adj3 arter$)) adj3 (disease or damage$ or disorder$ or disturbance or dissection or lesion or syndrome or arrest or accident or lesion or vasculopathy or insult or attack or injury or insufficiency or malformation or obstruct$ or anomal$)).tw.
5. ((cerebr$ or cerebell$ or vertebrobasil$ or interhemispheric or hemispher$ or intracran$ or corpus callosum or intracerebral or intracortical or intraventricular or periventricular or posterior fossa or infratentorial or supratentorial or MCA$ or ((anterior or posterior) adj3 circulation) or basal ganglia or ((basilar or brachial or vertebr$) adj3 arter$) or space-occupying or brain ventricle$ or subarachnoid$ or arachnoid$) adj3 (h?emorrhage or h?ematoma or bleed$ or microh?emorrhage or microbleed or (encephalorrhagia or hematencephal $))).tw.
6. ((cerebr$ or cerebell$ or arteriovenous or vertebrobasil$ or interhemispheric or hemispher$ or intracran$ or corpus callosum or intracerebral or intracortical or intraventricular or periventricular or posterior fossa or infratentorial or supratentorial or MCA$ or ((anterior or posterior) adj3 circulation) or basal ganglia or ((basilar or brachial or vertebr$) adj3 arter$) or space-occupying or brain ventricle$ or lacunar or cortical or ocular) adj3 (isch?emi$ or infarct$ or thrombo$ or emboli$ or occlus$ or hypoxi$ or vasospasm or obstruct$ or vasculopathy or vasoconstrict$)).tw.
7. ((carotid or cerebr$ or cerebell$ or intracranial or basilar or brachial or vertebr$) adj3 (aneurysm or malformation$ or dysplasia or disease or bruit or injur$ or obstruct$ or occlusion or constriction or presclerosis or scleros$ or stenos$ or atherosclero$ or arteriosclero$ or plaque $ or thrombo$ or embol$ or arteriopathy)).tw.
8. hemiplegia/ or paresis/ or exp gait disorders, neurologic/
9. (hemipleg$ or hemipar$ or paresis or paraparesis or paretic).tw.
10. or/1-9
11. exp torso/

12. exp abdominal muscles/ or exp back muscles/ or pectoralis muscles/ or exp respiratory muscles/
13. (trunk or truncal or thorax or thoracic or torso or diaphragm$ or intercostal or pectoral$ or ((rib or chest) adj3 (cavity or cage)) or pelvi$ or abdom$ or perine$ or peritonial or (core adj3 stabil$)).tw.
14. (back or erector spinae or spinal erector$ or sacrospinal$ or latissimus dorsi or levator scapulae or multifidus or paraspinal or trapezius).tw.
15. or/11-14
16. exp physical therapy modalities/
17. occupational therapy/ or physical therapy specialty/
18. "physical and rehabilitation medicine"/ or rehabilitation/ or exp neurological rehabilitation/ or telerehabilitation/
19. movement/ or locomotion/ or exp running/ or swimming/ or walking/ or dependent ambulation/ or exp gait/ or motor activity/ or exp exercise/
20. exp sports/
21. (exercis$ or train$ or condition$ or strengthen$ or rehab$ or stabili$).tw.
22. or/16-21
23. randomized controlled trial.pt.
24. controlled clinical trial.pt.
25. randomized.ab.
26. placebo.ab.
27. randomly.ab.
28. trial.ab.
29. groups.ab.
30. or/23-29
31. 10 and 15 and 22 and 30

Appendix 3. Embase Ovid search Strategy

1. cerebrovascular disease/ or exp cerebrovascular accident/ or exp cerebrovascular malformation/ or exp basal ganglion haemorrhage/ or exp brain hemorrhage/ or exp brain infarction/ or exp brain ischemia/ or cerebral artery disease/ or exp carotid artery disease/ or brain atherosclerosis/ or exp stroke patient/ or stroke rehabilitation/ or exp intracranial aneurysm/ or occlusive cerebrovascular disease/ or basilar artery obstruction/ or exp cerebral sinus thrombosis/ or middle cerebral artery occlusion/ or vertebral artery stenosis/ or ocular ischemic syndrome/ or vertebrobasilar insufficiency/ or exp carotid artery/ or carotid artery surgery/ or carotid endarterectomy/
2. exp stroke patient/
3. (stroke or poststroke or post-stroke or cerebrovasc$ or (cerebr$ adj3 vasc$) or CVA$ or apoplectic or apoplex$ or (transient adj3 isch?emic adj3 attack) or tia$ or SAH or AVM or (cerebral small vessel adj3 disease)).tw.
4. ((cerebr$ or cerebell$ or arteriovenous or vertebrobasil$ or interhemispheric or hemispher$ or intracran$ or intracerebral or infratentorial or supratentorial or MCA$ or ((anterior or posterior) adj3 circulat$) or lenticulostriate or ((basilar or brachial or vertebr$) adj3 arter$)) adj3 (disease or damage$ or disorder$ or disturbance or dissection or lesion or syndrome or arrest or accident or lesion or vasculopathy or insult or attack or injury or insufficiency or malformation or obstruct$ or anomal$)).tw.
5. ((cerebr$ or cerebell$ or vertebrobasil$ or interhemispheric or hemispher$ or intracran$ or corpus callosum or intracerebral or intracortical or intraventricular or periventricular or posterior fossa or infratentorial or supratentorial or MCA$ or ((anterior or posterior) adj3 circulation) or basal ganglia or ((basilar or brachial or vertebr$) adj3 arter$) or space-occupying or brain ventricle$ or subarachnoid$ or arachnoid$) adj3 (h?emorrhage or h?ematoma or bleed$ or microh?emorrhage or microbleed or (encephalorrhagia or hematencephal$))).tw.
6. ((cerebr$ or cerebell$ or arteriovenous or vertebrobasil$ or interhemispheric or hemispher$ or intracran$ or corpus callosum or intracerebral or intracortical or intraventricular or periventricular or posterior fossa or infratentorial or supratentorial or MCA$ or ((anterior or posterior) adj3 circulation) or basal ganglia or ((basilar or brachial or vertebr$) adj3 arter$) or space-occupying or brain ventricle$ or lacunar or cortical or ocular) adj3 (isch?emi$ or infarct$ or thrombo$ or emboli$ or occlus$ or hypoxi$ or vasospasm or obstruct$ or vasculopathy or vasoconstrict$)).tw.
7. ((carotid or cerebr$ or cerebell$ or intracranial or basilar or brachial or vertebr$) adj3 (aneurysm or malformation$ or dysplasia or disease or bruit or injur$ or obstruct$ or occlusion or constriction or presclerosis or scleros$ or stenos$ or atherosclero$ or arteriosclero$ or plaque$ or thrombo$ or embol$ or arteriopathy)).tw.
8. exp hemiplegia/ or exp paresis/ or neurologic gait disorder/
9. (hemipleg$ or hemipar$ or paresis or paraparesis or paretic).tw.
10. or/1-9
11. exp abdomen/ or exp thorax/ or trunk/ or exp pelvis/
12. exp abdominal wall musculature/ or exp back muscle/ or exp pelvis muscle/ or exp thorax muscle/
13. (trunk or truncal or thorax or thoracic or torso or diaphragm$ or intercostal or pectoral$ or ((rib or chest) adj3 (cavity or cage)) or pelvi$ or abdom$ or perine$ or peritonial or (core adj3 stabil$)).tw.
14. (back or erector spinae or spinal erector$ or sacrospinal$ or latissimus dorsi or levator scapulae or multifidus or paraspinal or trapezius).tw.
15. 11 or 12 or 13 or 14
16. exp exercise/

17. exp sports/
18. physical strength/ or physical endurance/ or physical fitness/
19. (exercis$ or train$ or condition$ or strengthen$ or rehab$ or stabili$).tw.
20. 16 or 17 or 18 or 19
21. Randomized Controlled Trial/ or "randomized controlled trial (topic)"/
22. Randomization/
23. Controlled clinical trial/ or "controlled clinical trial (topic)"/
24. control group/ or controlled study/
25. clinical trial/ or "clinical trial (topic)"/ or phase 1 clinical trial/ or phase 2 clinical trial/ or phase 3 clinical trial/ or phase 4 clinical trial/
26. crossover procedure/
27. single blind procedure/ or double blind procedure/ or triple blind procedure/
28. placebo/ or placebo effect/
29. (random$ or RCT or RCTs).tw.
30. (controlled adj5 (trial$ or stud$)).tw.
31. (clinical$ adj5 trial$).tw.
32. clinical trial registration.ab.
33. ((control or treatment or experiment$ or intervention) adj5 (group$ or subject$ or patient$)).tw.
34. (quasi-random$ or quasi random$ or pseudo-random$ or pseudo random$).tw.
35. ((control or experiment$ or conservative) adj5 (treatment or therapy or procedure or manage$)).tw.
36. ((singl$ or doubl$ or tripl$ or trebl$) adj5 (blind$ or mask$)).tw.
37. (cross-over or cross over or crossover).tw.
38. (placebo$ or sham).tw.
39. trial.ti.
40. (assign$ or allocat$).tw.
41. controls.tw.
42. or/21-41
43. 10 and 15 and 20 and 42

Appendix 4. CINAHL search strategy

S38 S10 AND S15 AND S23 AND S37
S37 S24 OR S25 OR S26 OR S27 OR S28 OR S29 OR S30 OR S33 OR S34 OR S35 OR S36
S36 TI (Clinical AND Trial) or AB (Clinical AND Trial) or SU (Clinical AND Trial)
S35 MH Clinical Trials
S34 TI Placebo* or AB Placebo* or SU Placebo*
S33 S31 AND S32
S32 TI blind* or AB mask* or AB blind* or TI mask*
S31 AB (singl* or doubl* or trebl* or tripl*) or TI (singl* or doubl* or trebl* or tripl*)
S30 TI (stroke or poststroke or post-stroke or cerebrovasc* or brain vasc* or cerebral vasc or cva or apoplex or SAH) or AB (stroke or poststroke or post-stroke or cerebrovasc* or brain vasc* or cerebral vasc or cva or apoplex or SAH)
S29 MH Placebos
S28 TI (crossover or cross-over) or AB (crossover or cross-over) or SU (crossover or cross-over)
S27 AB "latin square" or TI "latin square"
S26 TI random* or AB random*
S25 TI ("multicentre study" or "multicenter study" or "multi-centre study" or "multi-center study") or AB ("multicentre study" or "multicenter study" or "multi-centre study" or "multi-center study") or SU ("multicentre study" or "multicenter study" or "multi-centre study" or "multi-center study")
S24 MH Random Assignment or MH Single-blind Studies or MH Double-blind Studies or MH Triple-blind Studies or MH Crossover design or MH Factorial Design
S23 S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22
S22 TI (exercis* or train* or condition* or strengthen* or rehab* or stabili*) OR AB (exercis* or train* or condition* or strengthen* or rehab* or stabili*)
S21 (MH "Movement+")
S20 (MH "Rehabilitation") OR (MH "Physical Therapy+") OR (MH "Occupational Therapy") OR (MH "Telerehabilitation")
S19 (MH "Physical Endurance+") OR (MH "Exertion+") OR (MH "Muscle Strengthening+")
S18 (MH "Sports+")
S17 (MH "Therapeutic Exercise+")
S16 (MH "Exercise+")
S15 S11 OR S12 OR S13 OR S14
S14 TI (back or erector spinae or spinal erector* or sacrospinal* or latissimus dorsi or levator scapulae or multifidus or paraspinal or trapezius) OR AB (back or erector spinae or spinal erector* or sacrospinal* or latissimus dorsi or levator scapulae or multifidus or paraspinal or trapezius)

S13 TI (trunk or truncal or thorax or thoracic or torso or diaphragm* or intercostal or pectoral* or ((rib or chest) N3 (cavity or cage)) or pelvi* or abdom* or perine* or peritonial or (core N3 stabil*)) OR AB (trunk or truncal or thorax or thoracic or torso or diaphragm* or intercostal or pectoral* or ((rib or chest) N3 (cavity or cage)) or pelvi* or abdom* or perine* or peritonial or (core N3 stabil*))
S12 (MH "Pelvic Floor Muscles") OR (MH "Respiratory Muscles+") OR (MH "Pectoralis Muscles") OR (MH "Erector Spinae Muscles") OR (MH "Abdominal Muscles+")
S11 (MH "Torso") OR (MH "Thorax")
S10 S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9
S9 TI ((hemipleg* or hemipar* or paresis or paraparesis or paretic)) OR AB ((hemipleg* or hemipar* or paresis or paraparesis or paretic))
S8 (MH "Hemiplegia")
S7 TI (((carotid or cerebr* or cerebell* or intracranial or basilar or brachial or vertebr*) N3 (aneurysm or malformation* or dysplasia or disease or bruit or injur* or obstruct* or occlusion or constriction or presclerosis or scleros* or stenos* or atherosclero* or arteriosclero* or plaque* or thrombo* or embol* or arteriopathy))) OR AB (((carotid or cerebr* or cerebell* or intracranial or basilar or brachial or vertebr*) N3 (aneurysm or malformation* or dysplasia or disease or bruit or injur* or obstruct* or occlusion or constriction or presclerosis or scleros* or stenos* or atherosclero* or arteriosclero* or plaque* or thrombo* or embol* or arteriopathy)))
S6 TI (((cerebr* or cerebell* or arteriovenous or vertebrobasil* or interhemispheric or hemispher* or intracran* or corpus callosum or intracerebral or intracortical or intraventricular or periventricular or posterior fossa or infratentorial or supratentorial or MCA* or ((anterior or posterior) N3 circulation) or basal ganglia or ((basilar or brachial or vertebr*) N3 arter*) or space-occupying or brain ventricle* or lacunar or cortical or ocular) N3 (isch?emi* or infarct* or thrombo* or emboli* or occlus* or hypoxi* or vasospasm or obstruct* or vasculopathy or vasoconstrict*))) OR AB (((cerebr* or cerebell* or arteriovenous or vertebrobasil* or interhemispheric or hemispher* or intracran* or corpus callosum or intracerebral or intracortical or intraventricular or periventricular or posterior fossa or infratentorial or supratentorial or MCA* or ((anterior or posterior) N3 circulation) or basal ganglia or ((basilar or brachial or vertebr*) N3 arter*) or space-occupying or brain ventricle* or lacunar or cortical or ocular) N3 (isch?emi* or infarct* or thrombo* or emboli* or occlus* or hypoxi* or vasospasm or obstruct* or vasculopathy or vasoconstrict*)))
S5 TI (((cerebr* or cerebell* or vertebrobasil* or interhemispheric or hemispher* or intracran* or corpus callosum or intracerebral or intracortical or intraventricular or periventricular or posterior fossa or infratentorial or supratentorial or MCA* or ((anterior or posterior) N3 circulation) or basal ganglia or ((basilar or brachial or vertebr*) N3 arter*) or space-occupying or brain ventricle* or subarachnoid* or arachnoid*) N3 (h?emorrhage or h?ematoma or bleed* or microh?emorrhage or microbleed or (encephalorrhagia or hematencephal*)))) OR AB (((cerebr* or cerebell* or vertebrobasil* or interhemispheric or hemispher* or intracran* or corpus callosum or intracerebral or intracortical or intraventricular or periventricular or posterior fossa or infratentorial or supratentorial or MCA* or ((anterior or posterior) N3 circulation) or basal ganglia or ((basilar or brachial or vertebr*) N3 arter*) or space-occupying or brain ventricle* or subarachnoid* or arachnoid*) N3 (h?emorrhage or h?ematoma or bleed* or microh?emorrhage or microbleed or (encephalorrhagia or hematencephal*))))
S4 TI (((cerebr* or cerebell* or arteriovenous or vertebrobasil* or interhemispheric or hemispher* or intracran* or intracerebral or infratentorial or supratentorial or MCA* or ((anterior or posterior) N3 circulat*) or lenticulostriate or ((basilar or brachial or vertebr*) N3 arter*)) N3 (disease or damage* or disorder* or disturbance or dissection or lesion or syndrome or arrest or accident or lesion or vasculopathy or insult or attack or injury or insufficiency or malformation or obstruct* or anomal*))) OR AB (((cerebr* or cerebell* or arteriovenous or vertebrobasil* or interhemispheric or hemispher* or intracran* or intracerebral or infratentorial or supratentorial or MCA* or ((anterior or posterior) N3 circulat*) or lenticulostriate or ((basilar or brachial or vertebr*) N3 arter*)) N3 (disease or damage* or disorder* or disturbance or dissection or lesion or syndrome or arrest or accident or lesion or vasculopathy or insult or attack or injury or insufficiency or malformation or obstruct* or anomal*)))
S3 TI ((stroke or poststroke or post-stroke or cerebrovasc* or (cerebr* N3 vasc*) or CVA* or apoplectic or apoplex* or (transient N3 isch?emic N3 attack) or tia* or SAH or AVM or (cerebral small vessel N3 disease))) OR AB ((stroke or poststroke or post-stroke or cerebrovasc* or (cerebr* N3 vasc*) or CVA* or apoplectic or apoplex* or (transient N3 isch?emic N3 attack) or tia* or SAH or AVM or (cerebral small vessel N3 disease)))
S2 (MH "Stroke Patients")
S1 (MH "Cerebrovascular Disorders") OR (MH "Basal Ganglia Cerebrovascular Disease+") OR (MH "Carotid Artery Diseases") OR (MH "Carotid Artery Dissections") OR (MH "Carotid Artery Thrombosis") OR (MH "Carotid Stenosis") OR (MH "Cerebral Ischemia") OR (MH "Cerebral Ischemia, Transient") OR (MH "Hypoxia-Ischemia, Brain") OR (MH "Cerebral Small Vessel Diseases") OR (MH "Cerebral Vasospasm") OR (MH "Cerebral Arterial Diseases") OR (MH "Cerebral Aneurysm") OR (MH "Intracranial Arteriosclerosis") OR (MH "Moyamoya Disease") OR (MH "Intracranial Embolism and Thrombosis+") OR (MH "Intracranial Hemorrhage") OR (MH "Subarachnoid Hemorrhage") OR (MH "Stroke+") OR (MH "Vertebral Artery Dissections")

Appendix 5. PEDro search strategy

#1
Title and Abstract: trunk
Subdiscipline: neurology
Method: clinical trial

Appendix 6. SCOPUS search strategy

(TITLE-ABS-KEY (stroke OR poststroke OR apoplex* OR cva* OR sah OR brain* OR cerebr* OR cerebell* OR vertebrobasil* OR hemispher* OR intracran* OR intracerebral OR infratentorial OR supratentorial)) AND ((TITLE-ABS-KEY (trunk OR truncal OR thorax OR thoracic OR torso OR diaphragm* OR intercostal OR pectoral* OR pelvi* OR abdom* OR perine* OR peritonial OR core)) OR (TITLE-ABS-KEY (back OR "erector

spinae" OR "spinal erector*" OR sacrospinal* OR "latissimus dorsi" OR "levator scapulae" OR multifidus OR paraspinal OR trapezius))) AND (TITLE-ABS-KEY (exercis* OR train* OR condition* OR strengthen* OR rehab* OR stabili*)) AND (TITLE-ABS-KEY (randomly OR randomized OR trial OR rct))

Appendix 7. ProQuest Dissertations and Theses search strategy

AB,TI(stroke OR poststroke OR apoplex* OR cva* OR sah OR brain* OR cerebr* OR cerebell* OR vertebrobasil* OR hemispher* OR intracran* OR intracerebral OR infratentorial OR supratentorial) AND AB,TI(trunk OR truncal OR thorax OR thoracic OR torso OR diaphragm* OR intercostal OR pectoral* OR pelvi* OR abdom* OR perine* OR peritonial OR core OR back OR "erector spinae" OR "spinal erector*" OR sacrospinal* OR "latissimus dorsi" OR "levator scapulae" OR multifidus OR paraspinal OR trapezius) AND AB,TI(exercis* OR train* OR condition* OR strengthen* OR rehab* OR stabili*) AND AB,TI(random* OR trial)

Appendix 8. SPORTDiscus search strategy

S1DE "CEREBROVASCULAR disease" OR DE "BRAIN -- Hemorrhage" OR DE "CEREBRAL embolism & thrombosis" OR DE "STROKE" OR DE "BRAIN -- Wounds & injuries" OR DE "BRAIN damage" OR DE "CEREBROVASCULAR disease -- Patients"
S2TI (stroke or poststroke or post-stroke or cerebrovasc* or brain vasc* or cerebral vasc or cva or apoplex or SAH) or AB (stroke or poststroke or post-stroke or cerebrovasc* or brain vasc* or cerebral vasc or cva or apoplex or SAH)
S3(TI (brain* or cerebr* or cerebell* or intracran* or intracerebral) or AB (brain* or cerebr* or cerebell* or intracran* or intracerebral)) and (TI (ischemi* or ischaemi* or infarct* or thrombo* or emboli* or occlus*) or AB (ischemi* or ischaemi* or infarct* or thrombo* or emboli* or occlus*))
S4(TI (brain* or cerebr* or cerebell* or intracerebral or intracranial or subarachnoid) or AB (brain* or cerebr* or cerebell* or intracerebral or intracranial or subarachnoid)) and (TI (haemorrhage* or hemorrhage* or haematoma* or hematoma* or bleed*) or AB (haemorrhage* or hemorrhage* or haematoma* or hematoma* or bleed*))
S5DE "HEMIPLEGIA" OR DE "HEMIPLEGICS" OR DE "GAIT disorders"
S6TI (hemipleg* or hemipar* or paresis or paretic) or AB (hemipleg* or hemipar* or paresis or paretic)
S7S1 OR S2 OR S3 OR S4 OR S5 OR S6
S8DE "ABDOMINAL muscles" OR DE "ABDOMINAL wall" OR DE "CHEST Anatomy" OR DE "BACK muscles" OR DE "BACK physiology" OR DE "TORSO" OR DE "ABDOMEN"
S9TI (back or erector spinae or spinal erector* or sacrospinal* or latissimus dorsi or levator scapulae or multifidus or paraspinal or trapezius) OR AB (back or erector spinae or spinal erector* or sacrospinal$ or latissimus dorsi or levator scapulae or multifidus or paraspinal or trapezius)
S10TI (trunk or truncal or thorax or thoracic or torso or diaphragm* or intercostal or pectoral* or ((rib or chest) N3 (cavity or cage)) or pelvi* or abdom* or perine* or peritonial or (core N3 stabil*)) OR AB (trunk or truncal or thorax or thoracic or torso or diaphragm* or intercostal or pectoral* or ((rib or chest) N3 (cavity or cage)) or pelvi* or abdom* or perine* or peritonial or (core N3 stabil*))
S11S8 OR S9 OR S10
S12DE "PHYSICAL therapy" OR DE "BALNEOLOGY" OR DE "COLD therapy" OR DE "ELECTROTHERAPEUTICS" OR DE "HYDROTHERAPY" OR DE "LIANGONG" OR DE "MANIPULATION therapy" OR DE "OCCUPATIONAL therapy" OR DE "PHOTOTHERAPY" OR DE "RECREATIONAL therapy" OR DE "SPORTS physical therapy" OR DE "THERMOTHERAPY" OR DE "RECOVERY training" OR DE "SPORTS medicine" OR DE "OCCUPATIONAL therapy" OR DE "RECREATIONAL therapy" OR DE "THERAPEUTICS" OR DE "REHABILITATION" OR DE "AQUATIC exercises -- Therapeutic use" OR DE "MEDICAL rehabilitation" OR DE "NEUROPSYCHOLOGICAL rehabilitation" OR DE "ACTIVITIES of daily living training" OR DE "EXERCISE" OR DE "ABDOMINAL exercises" OR DE "AEROBIC exercises" OR DE "ANAEROBIC exercises" OR DE "AQUATIC exercises" OR DE "ARM exercises" OR DE "BACK exercises" OR DE "BREATHING exercises" OR DE "BREEMA" OR DE "BUTTOCKS exercises" OR DE "CALISTHENICS" OR DE "CHAIR exercises" OR DE "CHEST exercises" OR DE "CIRCUIT training" OR DE "COMPOUND exercises" OR DE "COOLDOWN" OR DE "DO-in" OR DE "EXERCISE adherence" OR DE "EXERCISE for girls" OR DE "EXERCISE for men" OR DE "EXERCISE for middle-aged persons" OR DE "EXERCISE for older people" OR DE "EXERCISE for people with disabilities" OR DE "EXERCISE for women" OR DE "EXERCISE for youth" OR DE "EXERCISE therapy" OR DE "EXERCISE video games" OR DE "FACIAL exercises" OR DE "FALUN gong exercises" OR DE "FOOT exercises" OR DE "GYMNASTICS" OR DE "HAND exercises" OR DE "HATHA yoga" OR DE "HIP exercises" OR DE "ISOKINETIC exercise" OR DE "ISOLATION exercises" OR DE "ISOMETRIC exercise" OR DE "ISOTONIC exercise" OR DE "KNEE exercises" OR DE "LEG exercises" OR DE "LIANGONG" OR DE "METABOLIC equivalent" OR DE "MULAN quan" OR DE "MUSCLE strength" OR DE "PILATES method" OR DE "PLYOMETRICS" OR DE "QI gong" OR DE "REDUCING exercises" OR DE "RUNNING" OR DE "RUNNING -- Social aspects" OR DE "SHOULDER exercises" OR DE "STRENGTH training" OR DE "STRESS management exercises" OR DE "TAI chi" OR DE "TREADMILL exercise" OR DE "WHEELCHAIR workouts" OR DE "YOGA" OR DE "EXERCISE videos" OR DE "PHYSICAL activity" OR DE "PHYSICAL fitness" OR DE "SPORTS"
S13TI (exercis* or train* or condition* or strengthen* or rehab* or stabili*) OR AB (exercis* or train* or condition* or strengthen* or rehab* or stabili*)
S14S12 OR S13
S15TI (randomised OR randomized) OR AB random* OR DE "RANDOMIZED controlled trials"
S16TI trial
S17AB control N5 group
S18S15 OR S16 OR S17
S19S7 AND S11 AND S14 AND S18

Appendix 9. US National Institutes of Health Ongoing Trials Register ClinicalTrials.gov

(trunk OR truncal OR thorax OR thoracic OR torso) AND AREA[StudyType] EXPAND[Term] COVER[FullMatch] "Interventional" AND AREA[ConditionSearch] (Brain Infarction OR Intracranial Hemorrhages OR Carotid Artery Diseases OR Brain Ischemia OR Cerebral Hemorrhage OR Cerebrovascular Disorders OR Stroke)

Appendix 10. World Health Organization International Clinical Trials Registry Platform

stroke AND trunk OR cerebral AND trunk OR cerebrovascular AND trunk OR brain AND trunk

Appendix 11. List of abbreviations

ABC: Activities-specific Balance Confidence Scale
ADIM: Abdominal drawing-in manoeuvre
ADL: Activities of daily living
AR: augmented reality
ARAT: Action Research Arm test
BBS: Berg Balance scale
BI: Barthel Index
BMI: Body Mass Index
BPM: Balance Performance Monitor
CG: control groep
CHD: coronary heart disease
CI: confidence interval
cm: centimetre
cm/s: centimetre per second
CoP: center of pressure
CP: conventional therapy
CSE: core-stability exercises
CT: computed tomography
CVA: cerebrovascular accident
CVD: cerebrovascular disease
cm: centimeter
CMS: Core muscle strengthening
d: effect size index
DG: device group
EMG: Electromyograph
EO: external oblique muscles
ES: erector spinae muscles
FAC: Functional Ambulation Category
FES: Functional electrical stimulation
FICSIT-4: Frailty and Injuries Cooperative Studies of Intervention Technique
FIST: Function in sitting test
FMA-LE: Fugl-Meyer Assessment-Lower Extremity
FR: forward reach
FRT: functional reach in standing
GRADE : Grading of Recommendations Assessment, Development and Evaluation
H: haemorrhagic
Hz: Hertz
HMD: head-mounted device
I: ischaemic
I/H: ischemic/hemorrhagic
ICD: International Classification of Diseases
K-MBI: Korean version of Modified Barthel Index
L: left
LED: light-emitting diode
LCD: liquid-crystal display
L/R: left/right
m: metre
m/s: metre per second
MBI: Modified Barthel Index
MMSE: Mini Mental State Examination

MMSE-K: Mini Mental State Examination-Korean version
MoCA: Montreal Cognitive Assessment
MRI: magnetic resonance imaging
m/s: meter/second
N: number
n/a: not applicable
NDT: Neurodevelopmental treatment
NIHSS: National Institutes of Health Stroke Scale
NEWSQOL: Newcastle Stroke-Specific Quality of Life Measure
NMES: neuromuscular electrical stimulation
NRS: numerical rating scale
OR: odds ratio
PASS: Postural Assessment Scale for Stroke
PBS(s): pressure biofeedback system
PEDro: Physiotherapy Evidence Database (PEDro)-scale
PNF: proprioceptive neuromuscular facilitation
POMA: Performance-oriented Mobility Assessment
R: right
RCT: randomised controlled trial
RNLI: Reintegration to Normal Living Index
RS: rhythmic stabilisation
s: seconds
SD: standard deviation
SE: standard error
SET: sling exercise therapy
SF-36: 36-Item Short Form Survey
SIS-16: Stroke Impact Scale
SMART: Specific, Measurable, Achievable, Realistic, and Timely
SMD: standardised mean differences
SPVFTCT: smartphone-based visual feedback trunk control training
SR: stabilising reversal
S-TIS: Spanish-Trunk Impairment Scale 2.0
STREAM: Stroke Rehabilitation Assessment of Movement
SVGA: Super VideoGraphics Array
TENS: transcutaneous electrical nerve stimulation
TIS: Trunk Impairment Scale
tNMES: trunk neuromuscular electrical stimulation
TrA: transversus abdominis
TRTT: task-related trunk training
TUG: Timed Up and Go Test
STE: selective-trunk exercise
VAS: visual analogue scale
VG: vibration group
VG: video game
VR: virtual reality
VRT: Virtual reality training
WBV: whole-body vibration
WSE: weight-shifting exercise
WST: weight-shifting training

HISTORY

Protocol first published: Issue 8, 2020

CONTRIBUTIONS OF AUTHORS

Thijs L: wrote the protocol and review, designed search strategies, was involved in conducting the search strategy, screening title and abstract of publications, extracted trials and outcome data and assessed risk of bias.

Voets E: was involved in screening the title and abstract of publications, extracted trials and outcome data and assessed risk of bias, provided general advice, contributed to the conception and design of the review and approved the review.

Denissen S: provided general advice on the protocol and was involved in screening the titles identified by the search.

Mehrholz J: provided general advice, contributed to the conception and design of the review, evaluated risk of bias of one study and approved the review.

Bernhard E: provided general advice, contributed to the conception and design of the review, evaluated risk of bias of one study and approved the review.

Lemmens R: provided general advice, contributed to the conception and design of the review and approved the review.

Verheyden G: wrote the protocol and review, was involved in resolving conflicts when screening the title and abstract of publications, extracted trials and outcome data and assessed risk of bias.

All of the review authors interpreted the results and approved the manuscript.

DECLARATIONS OF INTEREST

Thijs L: L. Thijs could be identified as the first author of an included study.

Voet E: E Voets could be identified as a co-author of an included study.

Denissen S: none known

Mehrholz J: none known

Bernhard E: none known

Lemmens R: R Lemmens could be identified as a co-author of an included study.

Verheyden G: G. Verheyden could be identified as the first author of an included study.

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- E! 11323, Other

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  Baekeland grant

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

The protocol stated that review authors LT and SD would conduct the full-text eligibility screening, data extraction, and quality assessment. However, LT and EV were the review authors who conducted this work.

Because interventions could have a lasting effect, we did not include cross-over randomised controlled trials.

In the analysis of the different trunk training approaches, we made a clearer distinction between the intensity of the intervention arms. As a result, we split meta-analysis into: (1) a meta-analysis with no additional therapy (non-dose-matched) and (2) a meta-analysis with same therapy amount in the control group (dose-matched).

We performed additional sensitivity analyses considering the use of random-effects models instead of fixed-effect models, a sensitivity analysis where studies with high risk of bias were excluded, and one after excluding trials where the mean change score was calculated.

In the protocol, we stated that the overall effects of dichotomous data were calculated using a random-effects model. In this review, however, we calculated effects using a fixed-effects model.

We also created additional summary of findings tables for therapy amount and the additional sensitivity analysis.

We defined in the protocol phase post stroke as a potential modifier. Additionally, we expanded this term in this review to time post stroke, displayed in days.

INDEX TERMS

Medical Subject Headings (MeSH)

Activities of Daily Living; Hand; *Hemorrhagic Stroke; Quality of Life; *Stroke

MeSH check words

Adult; Humans