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Mirror therapy for improving motor function after stroke (Review)

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[Intervention Review]

Mirror therapy for improving motor function after stroke

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ABSTRACT

Background

Mirror therapy is used to improve motor function after stroke. During mirror therapy, a mirror is placed in the person's midsagittal plane, thus reflecting movements of the non-paretic side as if it were the affected side.

Objectives

To summarise the effectiveness of mirror therapy compared with no treatment, placebo or sham therapy, or other treatments for improving motor function and motor impairment after stroke. We also aimed to assess the effects of mirror therapy on activities of daily living, pain, and visuospatial neglect.

Search methods

We searched the Cochrane Stroke Group's Trials Register, the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, Embase, CINAHL, AMED, PsycINFO and PEDro (last searched 16 August 2017). We also handsearched relevant conference proceedings, trials and research registers, checked reference lists, and contacted trialists, researchers and experts in our field of study.

Selection criteria

We included randomised controlled trials (RCTs) and randomised cross-over trials comparing mirror therapy with any control intervention for people after stroke.

Data collection and analysis

Two review authors independently selected trials based on the inclusion criteria, documented the methodological quality, assessed risks of bias in the included studies, and extracted data. We assessed the quality of the evidence using the GRADE approach. We analysed the results as standardised mean differences (SMDs) or mean differences (MDs) for continuous variables, and as odds ratios (ORs) for dichotomous variables.

Main results

We included 62 studies with a total of 1982 participants that compared mirror therapy with other interventions. Of these, 57 were randomised controlled trials and five randomised cross-over trials. Participants had a mean age of 59 years (30 to 73 years). Mirror therapy

was provided three to seven times a week, between 15 and 60 minutes for each session for two to eight weeks (on average five times a week, 30 minutes a session for four weeks).When compared with all other interventions, we found moderate-quality evidence that mirror therapy has a significant positive effect on motor function (SMD 0.47, 95% CI 0.27 to 0.67; 1173 participants; 36 studies) and motor impairment (SMD 0.49, 95% CI 0.32 to 0.66; 1292 participants; 39 studies). However, effects on motor function are influenced by the type of control intervention. Additionally, based on moderate-quality evidence, mirror therapy may improve activities of daily living (SMD 0.48, 95% CI 0.30 to 0.65; 622 participants; 19 studies). We found low-quality evidence for a significant positive effect on pain (SMD −0.89, 95% CI −1.67 to −0.11; 248 participants; 6 studies) and no clear effect for improving visuospatial neglect (SMD 1.06, 95% CI −0.10 to 2.23; 175 participants; 5 studies). No adverse effects were reported.

Authors' conclusions

The results indicate evidence for the effectiveness of mirror therapy for improving upper extremity motor function, motor impairment, activities of daily living, and pain, at least as an adjunct to conventional rehabilitation for people after stroke. Major limitations are small sample sizes and lack of reporting of methodological details, resulting in uncertain evidence quality.

PLAIN LANGUAGE SUMMARY

Mirror therapy for improving movement after stroke

Review question
Does mirror therapy improve movement, the performance of daily activities, pain, and lack of attention to and awareness of the affected field of vision (visuospatial neglect) after stroke.

Backround
Paralysis of the arm or leg is common after stroke and frequently causes problems with activities of daily living such as walking, dressing, or eating. Mirror therapy (MT) is a rehabilitation therapy in which a mirror is placed between the arms or legs so that the image of a moving non-affected limb gives the illusion of normal movement in the affected limb. By this setup, different brain regions for movement, sensation, and pain are stimulated. However, the precise working mechanisms of mirror therapy are still unclear. We conducted a search for literature in various databases and extracted the data of relevant studies.

Search date
This review identified studies up to 16 August 2017.

Study characteristics
We found 62 relevant studies, of which 57 randomly allocated participants to receive either MT or a control therapy (randomised controlled trials) and five provided both therapies to all participants, but in random order (cross-over trials). The studies involved a total of 1982 participants with a mean age of 59 years (30 to 73 years) after stroke. Mirror therapy was provided three to seven times a week, between 15 and 60 minutes for each session for two to eight weeks (on average five times a week, 30 minutes a session for four weeks).

Key results
At the end of treatment, mirror therapy moderately improved movement of the affected upper and lower limb and the ability to carry out daily activities for people within and also beyond six months after the stroke. Mirror therapy reduced pain after stroke, but mainly in people with a complex regional pain syndrome. We found no clear effect for visuospatial neglect. The beneficial effects on movement were maintained for six months, but not in all study groups. No adverse effects were reported.

Quality of the evidence
The studies provide moderately-reliable evidence that MT improves movement (motor function, motor impairment) and the performance of daily activities. However, there was only low reliability that MT decreases pain and visuospatial neglect. This may be due to the small number of studies. Further research is needed, with larger methodologically-sound studies.

SUMMARY OF FINDINGS

Summary of findings for the main comparison. Mirror therapy compared to all other interventions: primary and secondary outcomes for improving motor function after stroke

Mirror therapy compared to all other interventions: primary and secondary outcomes for improving motor function after stroke

Participants: people with paresis of the upper or lower limb, or both, caused by stroke

Setting: inpatient and outpatient

Intervention: mirror therapy

Control: no treatment, placebo or sham therapy, or other treatments for improving motor function and motor impairment after stroke

Outcomes	Illustrative comparative risks* (95% CI)		№ of participants (studies)	Quality of the evidence (GRADE)	Comment
	Assumed risk	Corresponding risk			
	Control	**Mirror therapy versus all other interventions**			
Motor function at the end of intervention phase: all outcome measures	**The mean motor function at the end of intervention phase - all studies in the control groups was NA**	**The mean motor function at the end of intervention phase - all studies in the intervention groups was 0.47 SDs higher (0.27 to 0.67 higher)**	1173 (36 RCTs)	⊕⊕⊕⊖ Moderate[a]	SMD 0.47, 95% CI 0.27 to 0.67; as a rule of thumb, 0.2 SD represents a small difference, 0.5 a moderate, and 0.8 a large difference
Motor impairment at the end of intervention phase: all outcome measures	**The mean motor impairment at the end of intervention phase - all studies in the control groups was NA**	**The mean motor impairment at the end of intervention phase - all studies in the intervention groups was 0.49 SDs higher (0.32 to 0.66 higher)**	1292 (39 RCTs)	⊕⊕⊕⊖ Moderate[a]	SMD 0.49, 95% CI 0.32 to 0.66; as a rule of thumb, 0.2 SD represents a small difference, 0.5 a moderate, and 0.8 a large difference
Fugl-Meyer Assessment upper extremity at the end of intervention phase	**The mean Fugl-Meyer Assessment score at the end of intervention phase - all studies in the control groups was NA**	**The mean Fugl-Meyer Assessment score at the end of intervention phase - all studies in the intervention groups was 4.32 pointshigher (2.46 to 6.19 higher)**	898 (28 RCTs)	⊕⊕⊖⊖ Low[a,b]	MD 4.32, 95% CI 2.46 to 6.19; the minimum important difference is approximately 5.25
Activities of daily living at the end of intervention phase: all studies	**The mean activities of daily living at the end of intervention phase - all studies in the control groups was NA**	**The mean activities of daily living at the end of intervention phase - all studies in the intervention groups was 0.48 SDs higher (0.29 to 0.67 higher)**	622 (19 RCTs)	⊕⊕⊕⊖ Moderate[a]	SMD 0.48, 95% CI 0.30 to 0.65; as a rule of thumb, 0.2 SD represents a small difference, 0.5 a moderate, and 0.8 a large difference

Pain at the end of intervention phase: all studies	**The mean pain at the end of intervention phase - all studies in the control groups was NA**	**The mean pain at the end of intervention phase - all studies in the intervention groups was 0.89 SDs lower (1.67 to 0.11 lower)**	248 (6 RCTs)	⊕⊕⊖⊖ Low[b,c]	SMD −0.89, 95% CI −1.67 to −0.11; as a rule of thumb, 0.2 SD represents a small difference, 0.5 a moderate, and 0.8 a large difference
Pain at the end of intervention phase after excluding studies with CRPS	**The mean pain at the end of intervention phase - studies without CRPS in the control groups was NA**	**The mean pain at the end of intervention phase - studies without CRPS in the intervention groups was 0.23 SDs lower (0.53 lower to 0.08 higher)**	176 (4 RCTs)	⊕⊕⊕⊖ Moderate[b]	SMD −0.23, 95% CI −0.53 to 0.08; as a rule of thumb, 0.2 SD represents a small difference, 0.5 a moderate, and 0.8 a large difference
Visuospatial neglect at the end of intervention: all studies	**The mean visuospatial neglect at the end of intervention phase - all studies in the control groups was NA**	**The mean visuospatial neglect at the end of intervention phase - all studies in the intervention groups was 1.06SDs higher (0.10 lower to 2.23 higher)**	175 (5 RCTs)	⊕⊕⊖⊖ Low[b,c]	SMD 1.06, 95% CI −0.10 to 2.23; as a rule of thumb, 0.2 SD represents a small difference, 0.5 a moderate, and 0.8 a large difference

*__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; **NA:** not applicable; **SD:** standard deviation; **SMD**: standardised mean difference; **MD**: mean difference; **CRPS**: complex regional pain syndrome

GRADE Working Group grades of evidence
High quality: We are very confident that the true effect lies close to that of the estimate of the effect
Moderate quality: We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different
Low quality: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect
Very low quality: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect

[a]Downgraded due to several ratings in one or more items with high or unknown risk of bias.
[b]Downgraded because 95% CI contains effect size of no difference and the minimum important difference.
[c]Downgraded due to unexplained heterogeneity.

BACKGROUND

Description of the condition

Cerebrovascular diseases, taken together with ischaemic heart diseases, are the leading causes of death worldwide. Stroke is one of the leading causes of long-term disability, particularly in high- and middle-income countries (Murray 2013). Immediately after stroke onset, approximately 80% of survivors have an upper or lower limb motor impairment (Barker 1997; Jorgensen 1995; Nakayama 1994). Full upper limb function is achieved by nearly 80% of people with mild paresis, but only by 20% of people with severe paresis of the upper limb (Nakayama 1994). Of those people with an initial plegic upper limb, only half regain some motor function in the paretic upper limb six months later (Kwakkel 2003). Two-thirds of people with lower limb impairment are not able to walk independently soon after their stroke, and after rehabilitation only half have independent walking function (Jorgensen 1995). The initial severity of upper and lower extremity paresis is one of the most important predictors of long-term functional recovery after stroke (Hendricks 2002; Jorgensen 1995; Nakayama 1994), but variability is high, possibly influenced by therapeutic interventions.

Up to 50% of people experience pain of the upper extremity during the first 12 months post-stroke, especially shoulder pain and complex regional pain syndrome-type I (CRPS-type I) (Jönsson 2006; Kocabas 2007; Lundström 2009; Sackley 2008). Pain after stroke may restrict activities of daily living and reduce quality of life (Jönsson 2006; Lindgren 2007).

Additionally, about 40% of people with an acute right hemispheric and 20% of people with a left hemispheric stroke present a unilateral neglect (Ringman 2004), especially visuospatial neglect. After three months a unilateral neglect was present in about 15% of people with a right and 5% of people with a left hemispheric stroke (Ringman 2004). Besides the spatial attention deficits, neglect is a negative factor for functional recovery (Farnè 2004; Katz 1999), and was found to be associated with a reduced health-related quality of life (Franceschini 2010).

Effective training strategies to promote motor recovery and activities of daily living, to reduce pain or visuospatial neglect or both are therefore needed to reduce the burden of stroke.

Description of the intervention

Evidence suggests that effective therapeutic interventions for regaining motor function should potentially focus on the practice of functional tasks (Van Peppen 2004). However, task-oriented training strategies, such as constraint-induced movement therapy (Corbetta 2015; French 2016; Liepert 1998; Miltner 1999; Taub 1993), require some degree of voluntary movement, and are therefore not applicable for people with severe paresis after stroke. Novel training strategies for this patient population use electromechanical training devices (Mehrholz 2015; Mehrholz 2017), electrical muscle stimulation (Hatem 2016; Urton 2007), or repetitive passive or assistive movement stimulation (Feys 2004; Platz 2005).

As an alternative treatment approach, mirror therapy has been proposed as potentially beneficial (Ramachandran 1994). In contrast to other interventions, which employ somatosensory input to assist motor recovery (Feys 2004), mirror therapy is based on visual stimulation. During mirror therapy, a mirror is placed in the person's midsagittal plane, thus reflecting the non-paretic side as if it were the affected side (Ramachandran 1995). By this setup, movements of the non-paretic limb create the illusion of normal movements of the paretic limb (Deconinck 2015). One of the advantages of mirror therapy is the relatively easy administration and the possibility of self-administered home therapy, even for people with severe motor deficits. Clinical studies reported effects of mirror therapy on pain reduction in arm amputees or CRPS-type I (Ramachandran 1995; Ramachandran 1996; Thieme 2016). Furthermore, mirror therapy was claimed to alleviate hemiparesis after stroke (Ramachandran 1994), which was confirmed in a pilot study (Altschuler 1999).

Recently, some authors have described 'mirror-like' video or computer-graphic setups, where a video or computer-graphic image of the moving limb is presented as if it were the opposite one (Adamovich 2009; Eng 2007; Gaggioli 2004; Hoermann 2017; In 2012; Laver 2017; Morganti 2003).

How the intervention might work

The concept of mirror therapy has been substantiated neurophysiologically. There is long-standing evidence that observation of movements and performance of the observed actions share similar cortical motor areas (Grèzes 2001). Movement mirroring (i.e. the inversion of the visual feedback) leads to an additional activation of the hemisphere contralateral to the perceived limb laterality (Deconinck 2015; Dohle 2004; Matthys 2009; Shinoura 2008). The mirror illusion may increase cortico-muscular excitability (Fukumura 2007; Garry 2005; Kang 2011; Kang 2012). However, the precise mechanisms of the effect of mirror therapy in people with stroke remain speculative. As the visual image of the paretic limb is perceived similarly to the person's own moving limb (Dohle 2004), the mirror illusion might prevent or reverse a learned non-use of the paretic limb (Liepert 1995). Also, by modulation of the cortico-muscular excitability, mirror therapy might directly stimulate motor recovery. Finally, mirror therapy was regarded as a variant of motor imagery training, which is based on repetitive imagination and mental rehearsal of motor tasks (Miltner 1998; Stevens 2003). Behavioural studies suggest that the experience of agency (the attribution of visual images of body parts as being controlled by oneself) relies on a tight temporal coupling of the visual feedback of active, but not passive, movements (Longo 2009). It is this active performance that seems to distinguish mirror therapy from movement observation therapy (Wang 2013b).

Imaging studies further suggest that mirrored computer-graphic images are processed similarly to those of real movements (Adamovich 2009; Dohle 2011), as long as the temporal and spatial consistency with real movements does not fall below certain thresholds (Franck 2001). Thus, even technically-generated images of a human moving limb can be integrated into the body scheme with the same sense of agency as during 'real' mirroring.

Regarding non-motor symptoms, some studies also found significant effects of mirror therapy on somatosensory impairment after stroke (Acerra 2007; Dohle 2009). Cortical effects might be different from those for rehabilitation of motor function (Fritzsch 2014). Besides, mirror therapy was proposed to reduce unilateral visuospatial neglect after stroke (Dohle 2009). The strong visual stimulus of watching self-induced movements in the neglected hemifield was postulated to be responsible for this effect. However, this could only be confirmed if the mirror was placed in the affected,

rather than the non-affected, side of the body (Ramachandran 1999).

Finally, mirror therapy was found to be effective in reducing pain in different conditions (Bowering 2013; Thieme 2016). It is hypothesised that mirror therapy may normalise central sensory processing by providing a physiological image of the affected limb (McCabe 2003).

Why it is important to do this review

Since the first publication of our Cochrane Review, a number of new clinical studies about mirror therapy after stroke have been published. An update of the review is therefore required in order to provide a current estimation of the available evidence and to address limitations found in the original review.

OBJECTIVES

To summarise the effectiveness of mirror therapy compared with no treatment, placebo or sham therapy, or other treatments for improving motor function and motor impairment after stroke. We also aimed to assess the effects of mirror therapy on activities of daily living, pain, and visuospatial neglect.

METHODS

Criteria for considering studies for this review

Types of studies

We included randomised controlled trials (RCTs) and cross-over RCTs comparing mirror therapy (provided by a mirror or a simultaneous video or virtual setup) with any other therapy modality, no therapy, or sham therapy. If we included cross-over RCTs, we only analysed the first period as a parallel-group trial.

Types of participants

We included studies examining participants with a paresis of the upper or lower limb, or both, caused by stroke (all types, severity and stages of stroke) aged over 18 years. If we identified studies with mixed populations of people with neurological conditions, we included those studies if separate data for people with stroke were available.

Types of interventions

Mirror therapy is defined as an intervention that uses a mirror to create a reflection of the non-paretic upper or lower limb, thus giving the person visual feedback of normal movement of the paretic limb. Using this setup, different variations in the experimental protocol are possible (Bieniok 2011; Dohle 2005). We included studies that used direct mirroring of movement of any regimen and variation (i.e. including video or virtual reality settings). However, we only included those studies where the regimen and delivery of mirror therapy could be identified. Furthermore, for studies with a combination of mirror therapy and other therapies in the experimental condition, we only included studies where a minimum of 50% of the experimental intervention time was applied for mirror therapy.

The control arm of the study could include a no-treatment group, usual or standard practice, or any other control treatment (i.e. placebo or sham therapy). We excluded studies where the influence of mirror therapy could not be isolated due to the comparison of different mirror therapy regimens or delivery. We contacted trialists if the regimen or delivery (or both) of mirror therapy or the control intervention was unclear.

Types of outcome measures

We evaluated outcome measures post-intervention and at follow-up after six months or longer.

Primary outcomes

The primary outcome was motor function. Due to the wide variety of outcome measures, we selected outcome measures to facilitate quantitative pooling. If more than one outcome measure was available we prioritised measures as follows:

- Upper limb and hand motor function: Action Research Arm Test (Lyle 1981), Wolf Motor Function Test (Wolf 2001), Motor Assessment Scale - upper limb and hand function or both (Carr 1985), Manual Function Test (Miyamoto 2009), Box and Bock Test (Mathiowetz 1985).
- Lower limb motor function: Motor Assessment Scale - Items 4 or 5 (or both) (Carr 1985), Berg Balance Scale (Berg 1992).
- Global motor function: Motor Assessment Scale (Carr 1985), Rivermead Motor Assessment Scale (Collen 1991).

However, if these scales were not available, we accepted other measurements that evaluate motor function.

Secondary outcomes

Secondary outcomes included measures of motor impairment (upper limb motor impairment: Fugl-Meyer Assessment - upper limb or hand function or both (Fugl-Meyer 1975); Brunnstrom Stages of the Upper Extremity (Brunnstrom 1966); Motricity Index - arm score, muscle or grip strength (Demeurisse 1980)); lower limb motor impairment: Fugl-Meyer Assessment - lower limb function (Fugl-Meyer 1975); Brunnstrom Stages of the Lower Extremity (Brunnstrom 1966), activities of daily living (e.g. Functional Independence Measure: Keith 1987), Barthel Index: Mahoney 1965)); pain (Visual Analogue Scale or Numeric Rating Scale), and visuospatial neglect. We also searched for reported adverse effects (e.g. swelling) and dropout rate.

Search methods for identification of studies

See the 'Specialised register' section in the Cochrane Stroke Group module. We searched for relevant trials in all languages and arranged translation of trial reports where necessary.

Electronic searches

We searched the Cochrane Stroke Group's Trials Register (last searched on 16 August 2017); Cochrane Central Register of Controlled Trials (CENTRAL; 2017, Issue 8) in the Cochrane Library (last searched on 16 August 2017); MEDLINE Ovid (1946 to August 2017); Embase Ovid (1974 to August 2017); Cumulative Index to Nursing and Allied Health Literature (CINAHL EBSCO; 1982 to August 2017); Allied and Complementary Medicine (AMED Ovid; 1985 to August 2017); PsycINFO Ovid (1806 to August 2017); and the Physiotherapy Evidence Database (PEDro; searched August 2017).

We developed the MEDLINE search strategy for this review with the assistance of the Cochrane Stroke Group's Information Specialist and adapted it to search the other databases (Appendix 1; Appendix

2). We included all languages, and imposed no date limits. As the subject area of this review is quite specific, we did not include a trials filter to maximise the sensitivity of the search.

We also searched ongoing trials and research registers:

- ISRCTN Registry (www.isrctn.com/, searched December 2016);
- ClinicalTrials.gov (www.clinicaltrials.gov/, searched December 2016);
- StrokeTrials Registry (www.strokecenter.org/trials/, searched December 2016);
- International Clinical Trials Registry Platform (ICTRP) (www.who.int/ictrp/en/, searched December 2016);

Searching other resources

In an effort to identify further published, unpublished and ongoing trials not available in the major databases, we:

- handsearched the following conference proceedings:
  - Deutsche Gesellschaft für Neurologie (2008 to 2016);
  - Deutsche Gesellschaft für Neurorehabilitation (2000, 2001, 2003, 2005, 2007, 2009, 2010, 2012, 2013, 2014, 2016);
  - Deutsche Gesellschaft für Neurotraumatologie und klinische Neurorehabilitation (2005, 2007, 2009, 2010, 2014, 2016);
  - European Stroke Conference (2001 to 2015);
  - European Congress of Neurorehabilitation (2011, 2013, 2015);
  - World Congress of Neurorehabilitation (1999, 2002, 2006, 2010, 2012, 2014, 2016);
  - World Congress of Physical Therapy (2003, 2007, 2011, 2015);
  - World Stroke Congress (2000, 2004, 2008, 2010, 2012, 2014);
- screened reference lists of all relevant articles and books;
- contacted trialists, experts, researchers and commercial companies (Reflex Pain Management Ltd) in our field of study to obtain information of unpublished studies and studies not available in the electronic databases;
- searched System for Information on Grey Literature in Europe (OpenSIGLE - www.opengrey.eu/, searched December 2016); and
- searched the REHABDATA database (www.naric.com/research/rehab, searched December 2016).

Data collection and analysis

Selection of studies

Two of three review authors (HT, NM and CD) independently screened titles of the references identified from the electronic database searches and ruled out obviously irrelevant references. We obtained abstracts or full texts, or both, of the remaining studies and used our inclusion criteria (types of studies, types of participants, types of interventions and outcome measures) to assess whether they were eligible for inclusion. We resolved disagreements by discussion. If the inclusion of a study was unclear due to missing information, we tried to contact the authors of the studies for further details. Otherwise, we listed the study as 'awaiting classification'.

Data extraction and management

Two of three review authors (HT, NM and CD) independently extracted trial and outcome data of the included trials using a checklist. Because two of the review authors (HT, CD) are principal investigators of included trials, other authors (JB, JM) did the data extraction of those study. The checklists for data extraction contained:

- methods of randomisation;
- methods of concealment of allocation;
- blinding;
- use of an intention-to-treat (ITT) analysis (all participants initially randomised were included in the analysis in their originally-allocated groups);
- adverse events;
- dropouts for all reasons;
- imbalance of important prognostic factors;
- participants (country, number of participants, age, gender, type of stroke, time since stroke onset to study entry);
- inclusion and exclusion criteria;
- details of interventions in treatment and control groups;
- outcomes;
- time points of measurement.

We tried to establish all unclear characteristics of the studies by contacting the trial co-ordinator or principal investigator. We checked the extracted data for agreement between review authors and entered the data into Review Manager 5 (RevMan 2014).

Assessment of risk of bias in included studies

We used the 'Risk of bias' assessment tool according to Chapter 8 of the *Cochrane Handbook for Systematic Reviews of Interventions* to assess the adequacy of methods for sequence generation (selection bias), concealment of allocation (selection bias), completeness of outcome data or handling of incomplete outcome data (attrition bias), and blinding of assessors (detection bias) (Higgins 2011).

We did not integrate blinding of therapists and participants as an item in the 'Risk of bias' assessment, since this appeared not to be possible for the type of interventions in this review.

We resolved disagreements in methodological assessment by consulting a third review author (MP, JM or JB), and reached consensus through discussion. If an article did not contain information on any methodological criteria, we contacted the study authors for additional information. If no further information was available, we rated the criteria as 'unclear'.

GRADE and 'Summary of findings' table

We assessed the quality of the evidence using the five GRADE considerations (study limitations, consistency of effect, imprecision, indirectness and publication bias) as described in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011), for the following main outcomes of analysis: motor function, motor impairment, Fugl-Meyer Assessment, activities of daily living, pain, pain at the end of intervention phase after excluding studies with CRPS, and visuospatial neglect, each at the end of the intervention phase. We presented key findings of the review, including a summary of the amount of data, the

magnitude of the effect size, and the overall quality of the evidence, in Summary of findings for the main comparison.

Measures of treatment effect

The primary and secondary outcome variables of interest were continuous outcomes. We entered data of post-intervention assessment and follow-up assessment at six months as means and standard deviations (SDs) and calculated the standardised mean difference (SMD) or mean difference (MD) with 95% confidence intervals (CIs) for each trial. We pooled data through calculation of the overall SMD/MD and 95% CI. For dichotomous data (adverse events, dropouts) we calculated odds ratios (ORs) between groups.

Unit of analysis issues

We considered randomised cross-over trials prior to cross-over and analysed only the first intervention phase.

Dealing with missing data

We contacted study authors if appropriate data for analysis were not adequately reported. If study authors did not respond within one month after contact, we tried to contact them at least once more. If data were not sufficient to decide on inclusion or exclusion of studies, we rated the studies as 'awaiting classification'. If data were insufficient for meta-analysis, we excluded the studies from meta-analysis. If we were unable to get the missing data for participants who dropped out, we only analysed the participants for which we had data. However, we considered an ITT analysis as part of the 'Risk of bias' assessment and performed a sensitivity analysis in which we excluded studies with no or unreported ITT analysis. We also conducted a sensitivity analysis, excluding studies with missing methodological data (therefore rated as 'unclear' risk of bias).

Assessment of heterogeneity

We evaluated clinical heterogeneity through reported clinical and methodological diversity, variability of participants, interventions, and outcomes in an additional table. We used the I^2 statistic to assess heterogeneity. We used a random-effects model, regardless of the level of heterogeneity. Thus, in the case of heterogeneity, we did not violate the preconditions of a fixed-effect model approach.

Assessment of reporting biases

We tried to minimise reporting bias through an extensive search of databases, handsearching of references lists and conference abstracts, and by contacting study authors, trialists, and experts in the field for other unpublished or ongoing trials. We also conducted a sensitivity analysis, excluding studies of low methodological quality.

Data synthesis

Where possible, we conducted a pooled analysis of primary outcomes (motor function) and secondary outcomes (motor impairment, activities of daily living, pain, visuospatial neglect, dropout rate) as described above, using a random-effects model.

Subgroup analysis and investigation of heterogeneity

We performed a subgroup analysis to establish the effectiveness of mirror therapy focused on upper or lower extremity. We also investigated heterogeneity regarding time since stroke. We performed a subgroup analysis separating participants in an acute/subacute stage from those in a chronic stage after stroke; the cut-off point for separating these subgroups was six months after stroke. We also investigated heterogeneity by the type of control intervention used. We separated subgroups using no (additional) control intervention, another control intervention, and sham intervention with restricted view on the paretic extremity.

Sensitivity analysis

We conducted a sensitivity analysis to test the robustness of the results, removing studies that we assessed to be of lower or ambiguous methodological quality (studies with risk of bias for at least one method of sequence generation, concealment of allocation, ITT analysis, or blinded assessors). We also reanalysed the data by removing cross-over RCTs.

RESULTS

Description of studies

See: Characteristics of included studies, Characteristics of excluded studies, Characteristics of studies awaiting classification, Characteristics of ongoing studies and Table 1.

Results of the search

We identified 33 new studies from the updated search of the Cochrane Stroke Group's Trials Register. We also identified 8879 references from other electronic databases and 14 references from other sources. After excluding all duplicate references we identified 3588 references from the updated search in all electronic databases (5408 with references in the first version of this review). Two review authors (HT, NM or CD) identified 519 possibly eligible studies (652 with studies in the first version of this review). We discarded 470 studies (599 with studies in the first version of this review). There was insufficient information to determine inclusion eligibility for six trials (Amimoto 2008; ISRCTN40903497; Magni 2014; May 2011; Wang 2013a; Yeldan 2015), but we failed to get in contact with the authors, so the studies are listed as 'awaiting classification' (see Characteristics of studies awaiting classification). We also identified 15 ongoing trials (see Characteristics of ongoing studies). We therefore include 49 new studies (62 with studies in the first version of this review) in this updated version of the review (see Figure 1).

Figure 1. Study flow diagram of updated search and selection process

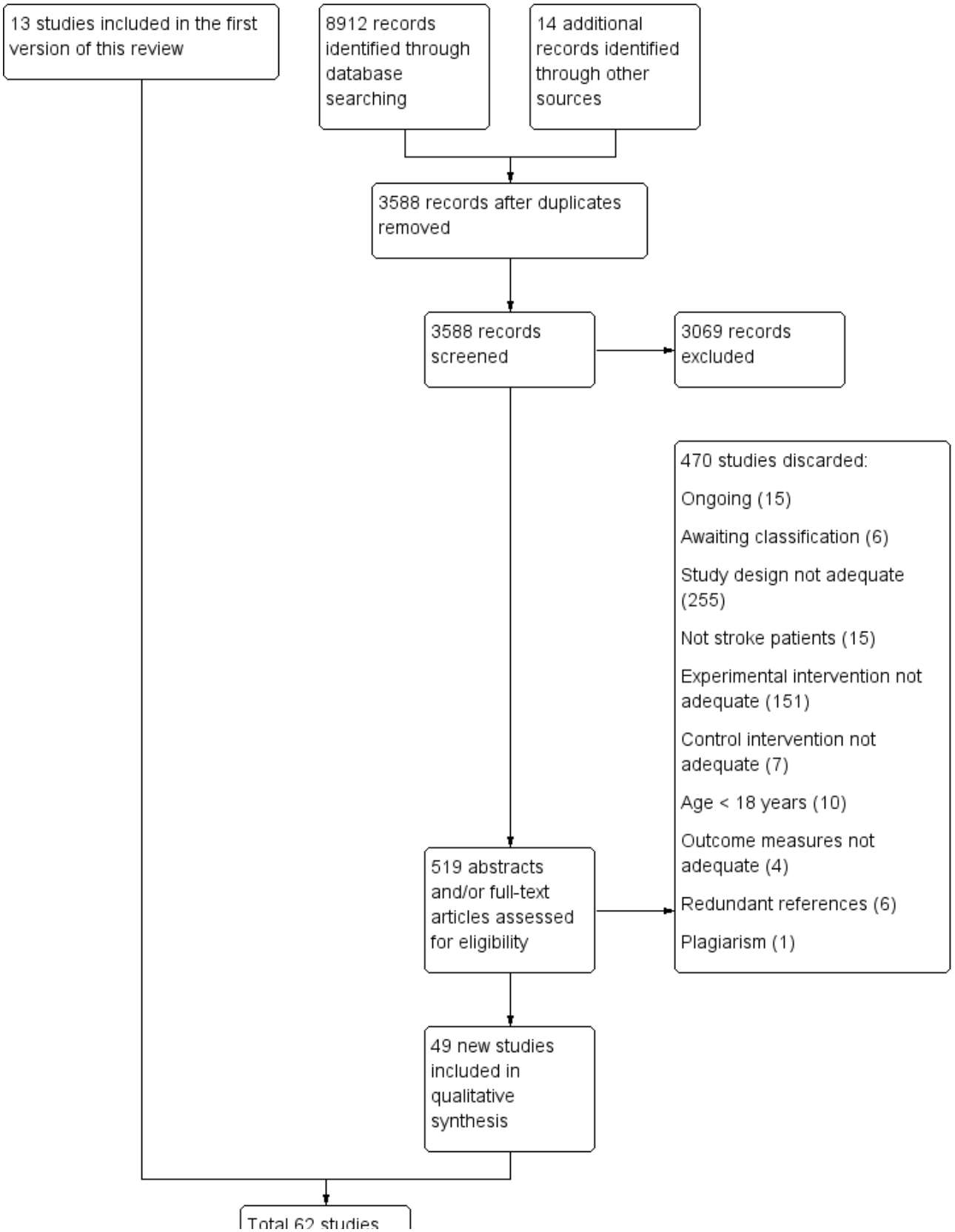
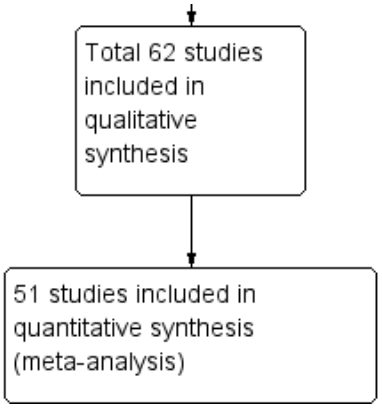


Figure 1. (Continued)



Included studies

Sixty-two trials met the inclusion criteria of our review (Acerra 2007; Alibakhshi 2016; Altschuler 1999; Amasyali 2016; Arya 2015; Arya 2017; Bae 2012; Bahrami 2013; Cacchio 2009a; Cacchio 2009b; Cha 2015; Cho 2015; Colomer 2016; Dalla Libera 2015; Dohle 2009; Geller 2016; Gurbuz 2016; Hiragami 2012; In 2012; In 2016; Invernizzi 2013; Ji 2014a; Kawakami 2015; Kim 2014; Kim 2015a; Kim 2016; Kojima 2014; Kumar 2013; Kuzgun 2012; Lee 2012; Lee 2016; Lim 2016; Lin 2014a; Manton 2002; Marquez 2012; Michielsen 2011; Mirela 2015; Mohan 2013; Moustapha 2012; Nagapattinam 2015; Pandian 2014; Park 2015a; Park 2015b; Piravej 2012; Rajappan 2016; Rehani 2015; Rodrigues 2016; Rothgangel 2004; Salhab 2016; Samuelkamaleshkumar 2014; Schick 2017; Seok 2010; Sütbeyaz 2007; Tezuka 2006; Thieme 2013; Tyson 2015; Wang 2015; Wu 2013; Yavuzer 2008; Yoon 2014; Yun 2011; Zacharis 2014) (see Characteristics of included studies).

We now exclude one study which we had included in the first version of this review, as only 15% of the experimental intervention was spent in mirror therapy (Ietswaart 2011).

Because the two groups in Rothgangel 2004 received significantly different treatment sessions, we decided to split the data and analyse them separately (outpatient group: Rothgangel 2004a, and inpatient group: Rothgangel 2004b).

Design

Fifty-seven studies were RCTs with a parallel-group design (Acerra 2007; Alibakhshi 2016; Amasyali 2016; Arya 2015; Arya 2017; Bae 2012; Bahrami 2013; Cacchio 2009a; Cacchio 2009b; Cha 2015; Cho 2015; Colomer 2016; Dalla Libera 2015; Dohle 2009; Geller 2016; Gurbuz 2016; Hiragami 2012; In 2012; In 2016; Invernizzi 2013; Ji 2014a; Kawakami 2015; Kim 2014; Kim 2015a; Kim 2016; Kumar 2013; Kuzgun 2012; Lee 2012; Lee 2016; Lim 2016; Lin 2014a; Manton 2002; Marquez 2012; Michielsen 2011; Mirela 2015; Mohan 2013; Nagapattinam 2015; Pandian 2014; Park 2015a; Park 2015b; Piravej 2012; Rajappan 2016; Rehani 2015; Rodrigues 2016; Rothgangel 2004; Samuelkamaleshkumar 2014; Schick 2017; Seok 2010; Sütbeyaz 2007; Thieme 2013; Tyson 2015; Wang 2015; Wu 2013; Yavuzer 2008; Yoon 2014; Yun 2011; Zacharis 2014), and five studies used a cross-over design with random allocation to the order of treatment (Altschuler 1999; Kojima 2014; Moustapha 2012; Salhab 2016; Tezuka 2006).

Sample Size

The 62 studies included a total of 1982 participants. Individual sample sizes of identified trials ranged from six (Geller 2016) to 94 (Tyson 2015). A detailed description of individual sample sizes can be found in Characteristics of included studies.

Participants

Not all studies provided data on characteristics of participants. Detailed descriptions of participant characteristics are given in Table 1.

The mean age of participants in the included studies was 59 years, with a range from 30 years (Moustapha 2012) to 78 years (Tezuka 2006). There were more participants with a hemiparesis of the left side (53%). There were more men (60%) than women (40%). Twenty-four studies included participants after their first-ever stroke. Mean time post-stroke ranged between five days (Acerra 2007), and five years (Altschuler 1999). Twenty-nine studies included participants in the acute or subacute phase after stroke (within six months post-stroke) and 21 trials included participants in the chronic phase (more than six months). Among those participants with known aetiology, 67% had an ischaemic and 33% a haemorrhagic stroke.

Fifty-two studies provided information on the study setting: 39 inpatient rehabilitation settings or hospitals; three inpatient and outpatient rehabilitation settings; four home settings; two inpatient and home setting; and four outpatient settings (Table 2). The included studies were conducted in 21 different countries.

Inclusion and exclusion criteria of studies are listed in Characteristics of included studies.

Interventions

Characteristics of interventions are summarised in Table 2. All except two included studies (In 2012; In 2016), provided mirror therapy using a mirror or a mirror box in the midsagittal plane between the upper or lower limbs. Thus the mirror reflected movements of the non-affected side as if these movements were executed with the affected side. In 2012 and In 2016 used a virtual reflection setting where the affected extremity was placed under a screen while the non-affected extremity was placed under a camera. The screen displayed the mirrored picture of the unaffected limb.

Ten studies examined the effects of mirror therapy for the lower extremity (Arya 2017; Cha 2015; In 2016; Kawakami 2015; Kumar 2013; Lee 2016; Marquez 2012; Mohan 2013; Salhab 2016; Sütbeyaz 2007); all other studies examined the effects of mirror therapy for the upper extremity.

Eleven studies used a combination of mirror therapy and other interventions. Kim 2014, Kim 2015a, Lee 2016, and Yun 2011 integrated a combination of mirror therapy with functional or neuromuscular electrical stimulation, Kojima 2014 and Schick 2017 with electromyographic-triggered electrical muscle stimulation, and Lin 2014a combined mirror therapy with electrical sensory stimulation using a mesh-glove. Mirror therapy was further combined with transcranial direct current stimulation (Cho 2015), or transcranial magnetic stimulation (Cha 2015; Dalla Libera 2015; Ji 2014a). If studies used two experimental groups, we combined both intervention groups for analysis.

Mirror therapy was provided for between three and seven days a week, and for between two and eight weeks. Each session lasted between 15 and 60 minutes. The total time for experimental intervention was between 225 and 2160 minutes.

Rothgangel 2004 included 16 participants and randomised them to mirror therapy or bilateral arm training. However, six of the participants were treated in an outpatient rehabilitation centre, and 10 in an inpatient care facility, which led to a significant difference in treatment time: the outpatient group received 17 treatment sessions of 30 minutes each; the inpatient group received 37 treatment sessions of 30 minutes each. Because these two groups are considerably different in total treatment time, we decided to analyse them separately (outpatient group: Rothgangel 2004a, and inpatient group: Rothgangel 2004b).

In 29 studies participants performed bilateral movements, moving the affected limb behind the mirror as best they could. In 22 studies participants only moved the unaffected side while looking in the mirror. In two studies participants performed both uni- and bilateral movements (In 2016; Kawakami 2015). In Rothgangel 2004 participants with muscle hypotonia had to move the affected arm as best they could; participants with muscle hypertonia should only move the unaffected arm while looking into the mirror. In two studies, a therapist passively moved the affected arm behind the mirror according to the movements of the unaffected one (Pandian 2014; Tezuka 2006).

In 11 studies the control group received no additional intervention other than standard rehabilitation. Twenty-two studies used a form of sham therapy where the reflecting side of the mirror was covered, or the non-reflecting side of the mirror was placed in the direction of the unaffected arm while practising. Eleven studies provided interventions with an unrestricted view of the affected side using the same training as in the experimental groups but without a mirror or with a plexiglas between limbs. Eighteen studies used other interventions in the control groups: electromyographic-triggered muscle stimulation (Amasyali 2016; Kawakami 2015; Schick 2017; Wang 2015); (functional) electrical muscle stimulation (Kawakami 2015; Nagapattinam 2015; Yun 2011); conventional therapy (Arya 2015; Arya 2017; Geller 2016; Kim 2016; Salhab 2016; Wu 2013); motor imagery (Cacchio 2009b); passive mobilisation of the affected limb (Colomer 2016; Kawakami 2015); transcranial magnetic stimulation (Dalla Libera 2015); task-oriented training (Lin 2014a); motor relearning programme (Rehani 2015); lower limb activities (Tyson 2015); or constraint-induced movement therapy (Yoon 2014). In one study a therapist passively moved the affected arm according to the movements of the unaffected one, but without a mirror between limbs (Tezuka 2006). If studies integrated two control groups we combined both groups for analysis (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). However, for testing the influence of different control treatments, we analysed single control groups in a subgroup analysis. Based on the difference of using a covered mirror, another intervention without mirror (also transparent plexiglas), or no additional therapy, we performed a subgroup analysis differentiating the effects of types of control intervention (covered mirror versus another intervention with unrestricted view versus no additional therapy) (Analysis 3.1).

Outcome

The included studies used a number of different outcomes. A description of the outcome measures used can be found in Characteristics of included studies.

Primary outcome: motor function

For analysis of our primary outcome of motor function we used the Motor Assessment Scale Item 7 (Acerra 2007; Marquez 2012; Piravej 2012), the Box and Block Test (Alibakhshi 2016; Amasyali 2016; Cho 2015; Kim 2015a; Lin 2014a; Samuelkamaleshkumar 2014; Schick 2017; Ji 2014a), the Action Research Arm Test (Dohle 2009; Geller 2016; Invernizzi 2013; Kim 2016; Michielsen 2011; Nagapattinam 2015; Thieme 2013; Tyson 2015), the Wolf Motor Function Test (functional ability) (Cacchio 2009a; Cacchio 2009b; Colomer 2016; Hiragami 2012; Kojima 2014; Yoon 2014), the Manual Function Test (Bae 2012; In 2012; Kim 2014; Lee 2012; Park 2015b; Seok 2010), the Berg Balance Scale (Cha 2015; In 2016; Lee 2016), the Brunnel Balance Assessment (Mohan 2013), the CAHAI (Rehani 2015), and the TEMPA (Rodrigues 2016).

Secondary outcomes: motor impairment, activities of daily living, pain and visuospatial neglect

For analysing motor impairment we used the Fugl-Meyer score (Alibakhshi 2016; Amasyali 2016; Arya 2015; Arya 2017; Cho 2015; Colomer 2016; Dalla Libera 2015; Dohle 2009;Geller 2016; Gurbuz 2016; Hiragami 2012; In 2012; Kim 2014; Kim 2016; Kojima 2014; Kumar 2013; Kuzgun 2012; Lee 2012; Lim 2016; Lin 2014a; Michielsen 2011; Mirela 2015; Mohan 2013; Park 2015a; Rodrigues 2016; Samuelkamaleshkumar 2014; Schick 2017; Ji 2014a; Tezuka 2006; Thieme 2013; Wang 2015; Wu 2013; Yoon 2014; Yun 2011), the Brunnstrom stages of motor recovery (Piravej 2012; Sütbeyaz 2007; Yavuzer 2008), muscle or grip strength (Acerra 2007; Lee 2016; Marquez 2012), the Motricity Index (Invernizzi 2013; Tyson 2015), and the Manual Muscle Test (Seok 2010).

In our pooled analysis of the secondary outcome activities of daily living we used the Functional Independence Measure (Dohle 2009; Geller 2016; Hiragami 2012; Invernizzi 2013; Kim 2015a; Kim 2016; Pandian 2014; Park 2015a; Park 2015b; Sütbeyaz 2007; Yavuzer 2008), the Barthel Index (Kuzgun 2012; Lim 2016; Piravej 2012; Schick 2017; Thieme 2013 ; Yoon 2014), and the Motor Activity Log (amount of use) (Kojima 2014; Lin 2014a; Wu 2013).

For the analysis of the secondary outcome of pain we included the measurement of pain at rest (Acerra 2007; Cacchio 2009b; Michielsen 2011), and during movement (Cacchio 2009a; Dohle 2009). The investigators used Numerical Rating Scales between 0

and 10 (Acerra 2007), Visual Analogue Scales between 0 and 10 (Cacchio 2009a), or between 0 mm and 100 mm (Cacchio 2009b; Michielsen 2011), or the pain section of the Fugl-Meyer Assessment, normalised on the average score for each item (0 to 2; 2 indicating no pain) (Dohle 2009, Thieme 2013).

Visuospatial neglect as an outcome was analysed using the Star Cancellation Test (Moustapha 2012; Pandian 2014; Thieme 2013; Tyson 2015), and a self-developed score (Dohle 2009).

Follow-up assessment

For analysis of sustained treatment effects for our primary outcome of motor function, we used only the data of follow-up assessments after six months (Cacchio 2009a; Michielsen 2011), as well as for motor impairment (Michielsen 2011; Sütbeyaz 2007; Yavuzer 2008).

Adverse effects

Twenty-one studies explicitly reported the assessment of adverse effects (Acerra 2007; Alibakhshi 2016; Amasyali 2016; Arya 2015; Arya 2017; Colomer 2016; Hiragami 2012; Invernizzi 2013; Kojima 2014; Kuzgun 2012; Lin 2014a; Marquez 2012; Mohan 2013; Rodrigues 2016; Nagapattinam 2015; Schick 2017; Sütbeyaz 2007; Tyson 2015; Wu 2013; Yavuzer 2008; Zacharis 2014). No adverse events were reported.

Excluded studies

We discarded 470 studies following consideration of abstracts, full texts or both (see: Characteristics of excluded studies). In the Excluded studies section, we mention only those studies that might in a superficial view appear to meet the eligibility criteria and those studies that we classified as well-known and likely to be considered relevant by some readers (Characteristics of excluded studies).

Risk of bias in included studies

All details about the methodological quality of the included studies using the 'Risk of bias' assessment tool (Higgins 2011) are provided in Characteristics of included studies and Figure 2.

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

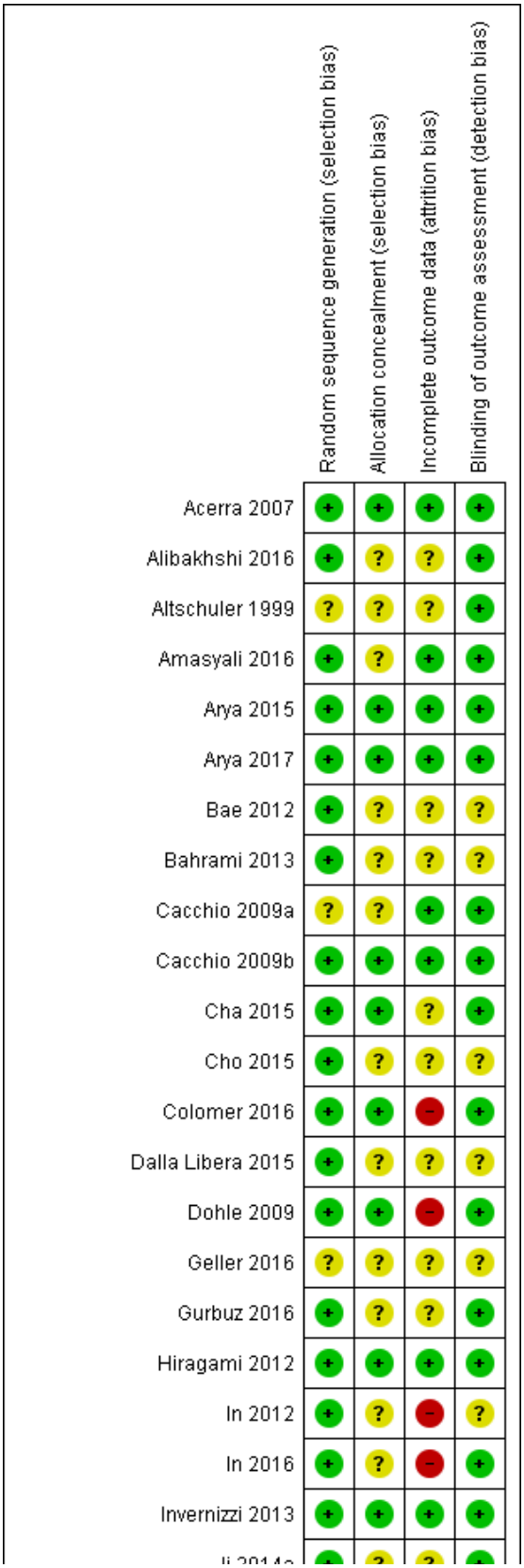


Figure 2. (Continued)

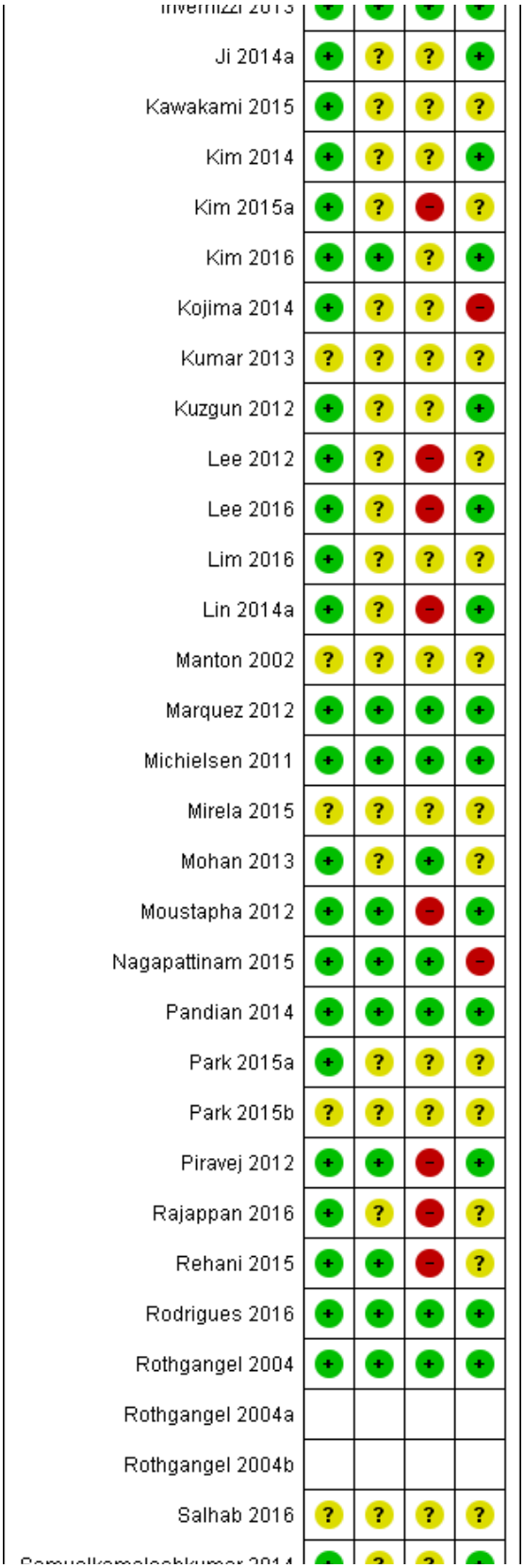
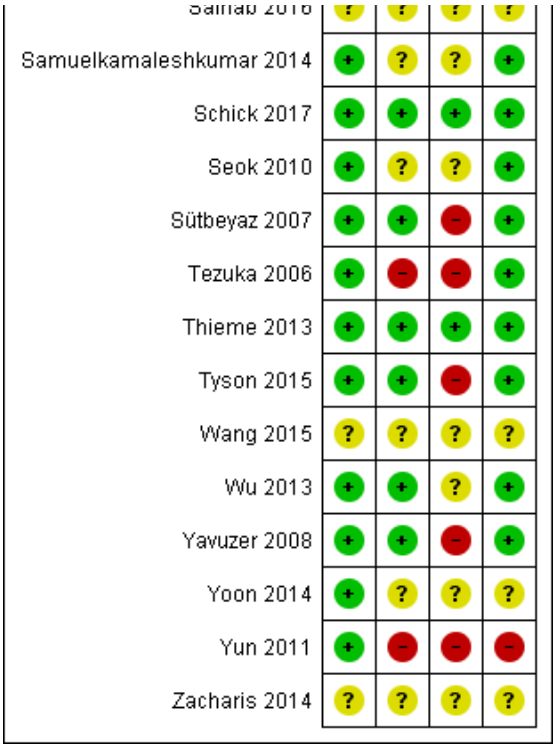


Figure 2. (Continued)



We emailed all trialists of the included studies to clarify some methodological or design issues, or both. Most trialists provided at least some of the requested information. Two review authors (from HT, NM, CD, JB or JM) independently evaluated the methodological quality of the studies. The assessing authors discussed all disagreements and resolved them by contacting another author or by obtaining additional information through contact with the principal investigator of the study.

Allocation

Fifty-two studies used adequate randomisation procedures, and were therefore at low risk of bias (Acerra 2007; Alibakhshi 2016; Amasyali 2016; Arya 2015; Arya 2017; Bae 2012; Bahrami 2013; Cacchio 2009b; Cha 2015; Cho 2015; Colomer 2016; Dalla Libera 2015; Dohle 2009; Gurbuz 2016; Hiragami 2012; In 2012; In 2016; Invernizzi 2013; Ji 2014a; Kawakami 2015; Kim 2014; Kim 2015a; Kim 2016; Kojima 2014; Kuzgun 2012; Lee 2012; Lee 2016; Lim 2016; Lin 2014a; Marquez 2012; Michielsen 2011; Mohan 2013; Moustapha 2012; Nagapattinam 2015; Pandian 2014; Park 2015a; Piravej 2012; Rajappan 2016; Rehani 2015; Rodrigues 2016; Rothgangel 2004; Samuelkamaleshkumar 2014; Schick 2017; Seok 2010; Sütbeyaz 2007; Tezuka 2006; Thieme 2013; Tyson 2015; Wu 2013; Yavuzer 2008; Yoon 2014; Yun 2011). We were not able to rate risk of bias for 10 trials due to missing information about the sequence generation process (Altschuler 1999; Cacchio 2009a; Geller 2016; Kumar 2013; Manton 2002; Mirela 2015; Park 2015b; Salhab 2016; Wang 2015; Zacharis 2014). Five studies used a cross-over design with random allocation to the order of treatment (Altschuler 1999; Kojima 2014; Moustapha 2012; Salhab 2016; Tezuka 2006). We only analysed the first treatment period as a parallel-group design in these five studies. Eight studies used block randomisation methods (Cacchio 2009b; Hiragami 2012; Kojima 2014; Lin 2014a; Mohan 2013; Piravej 2012; Sütbeyaz 2007; Yavuzer 2008). One study randomly allocated ability-matched pairs to treatment groups (Manton 2002).

Twenty-five studies used an adequate concealment of allocation, and we therefore considered them to be at low risk of bias (Acerra 2007; Arya 2015; Arya 2017; Cacchio 2009b; Cha 2015; Colomer 2016; Dohle 2009; Hiragami 2012; Invernizzi 2013; Kim 2016; Marquez 2012; Michielsen 2011; Moustapha 2012; Pandian 2014; Piravej 2012; Rehani 2015; Rodrigues 2016; Rothgangel 2004; Nagapattinam 2015; Schick 2017; Sütbeyaz 2007; Thieme 2013; Tyson 2015; Wu 2013; Yavuzer 2008). There was no description of the allocation concealment process, so we rated 35 trials at unclear risk of bias (Alibakhshi 2016; Altschuler 1999; Amasyali 2016; Bae 2012; Bahrami 2013; Cacchio 2009a; Cho 2015; Dalla Libera 2015; Geller 2016; Gurbuz 2016; In 2012; In 2016; Ji 2014a; Kawakami 2015; Kim 2014; Kim 2015a; Kojima 2014; Kumar 2013; Kuzgun 2012; Lee 2012; Lee 2016; Lim 2016; Lin 2014a; Manton 2002; Mirela 2015; Mohan 2013; Park 2015a; Park 2015b; Rajappan 2016; Salhab 2016; Samuelkamaleshkumar 2014; Seok 2010; Wang 2015; Yoon 2014; Zacharis 2014). Two studies were at high risk of bias because the authors of the trials confirmed that no concealment of allocation process had occurred (Tezuka 2006; Yun 2011). The methods used for concealment of allocation are presented in Characteristics of included studies.

Blinding

We rated 37 studies at low risk of bias, since at least the primary outcome measures were assessed by people blinded to group allocation (Acerra 2007; Alibakhshi 2016; Altschuler 1999; Amasyali 2016; Arya 2015; Arya 2017; Cacchio 2009a; Cacchio 2009b; Cha 2015; Colomer 2016; Dohle 2009; Gurbuz 2016; Hiragami 2012; In 2016; Invernizzi 2013; Ji 2014a; Kim 2014; Kim 2016; Kuzgun 2012; Lee 2016; Lin 2014a; Marquez 2012; Michielsen 2011; Moustapha

2012; Pandian 2014; Piravej 2012; Rodrigues 2016; Rothgangel 2004; Samuelkamaleshkumar 2014; Schick 2017; Seok 2010; Sütbeyaz 2007; Tezuka 2006; Thieme 2013; Tyson 2015; Wu 2013; Yavuzer 2008). In 22 studies the process of blinding was not described (Bae 2012; Bahrami 2013; Cho 2015; Dalla Libera 2015; Geller 2016; In 2012; Kawakami 2015; Kim 2015a; Kumar 2013; Lee 2012; Lim 2016; Manton 2002; Mirela 2015; Mohan 2013; Park 2015a; Park 2015b; Rajappan 2016; Rehani 2015; Salhab 2016; Wang 2015; Yoon 2014; Zacharis 2014). In three trials the study authors stated that the assessors of the primary outcome measure were not blinded, so we considered them to be at high risk of bias (Kojima 2014; Nagapattinam 2015; Yun 2011)

Incomplete outcome data

Seventeen studies conducted an ITT analysis that included incomplete outcome data (Acerra 2007; Amasyali 2016; Arya 2015; Arya 2017; Cacchio 2009a; Cacchio 2009b; Hiragami 2012; Invernizzi 2013; Marquez 2012; Michielsen 2011; Mohan 2013; Nagapattinam 2015; Pandian 2014; Rodrigues 2016; Rothgangel 2004; Schick 2017; Thieme 2013). No description of handling incomplete outcome data was available in 28 studies, and we considered them to be at unclear risk of bias for this domain (Alibakhshi 2016; Altschuler 1999; Bae 2012; Bahrami 2013; Cha 2015; Cho 2015; Dalla Libera 2015; Geller 2016; Gurbuz 2016; Ji 2014a; Kawakami 2015; Kim 2014; Kim 2016; Kojima 2014; Kumar 2013; Kuzgun 2012; Lim 2016; Manton 2002; Mirela 2015; Park 2015a; Park 2015b; Salhab 2016; Samuelkamaleshkumar 2014; Seok 2010; Wang 2015; Wu 2013; Yoon 2014; Zacharis 2014). Seventeen studies reported that no ITT analysis was performed, and we rated them at high risk of bias (Colomer 2016; Dohle 2009; In 2012; In 2016; Kim 2015a; Lee 2012; Lee 2016; Lin 2014a; Moustapha 2012; Piravej 2012; Rajappan 2016; Rehani 2015; Sütbeyaz 2007; Tezuka 2006; Tyson 2015; Yavuzer 2008; Yun 2011)

Selective reporting

We did not evaluate studies for selective reporting.

Other potential sources of bias

Twenty studies did not report whether or not participants dropped out during the intervention. In the remaining 42 studies, 109 participants dropped out, which is a rate of 5.5%. Seventeen studies reported no dropouts during the intervention period, 17 trialists reported dropout rates of 15% or less, and in eight studies the dropout rate was above 15%. Fifty-nine participants dropped out of the experimental groups and 51 participants dropped out of the control groups, giving balanced dropout rates between groups. A detailed description of study characteristics can be found in Characteristics of included studies.

Effects of interventions

See: **Summary of findings for the main comparison** Mirror therapy compared to all other interventions: primary and secondary outcomes for improving motor function after stroke

Comparison 1: Mirror therapy versus all other interventions

Outcome 1.1: Motor function at the end of the intervention phase

We included 36 studies in a pooled analysis of motor function after study end, with a total of 615 participants in the intervention and 558 in the control groups in the post-assessment data analysis (Acerra 2007; Alibakhshi 2016; Amasyali 2016; Bae 2012; Cacchio 2009a; Cacchio 2009b; Cha 2015; Cho 2015; Colomer 2016; Dohle 2009; Hiragami 2012; In 2012; In 2016; Invernizzi 2013; Kim 2014; Kim 2015a; Kim 2016;Kojima 2014; Lee 2012; Lee 2016; Lin 2014a; Marquez 2012; Michielsen 2011; Mohan 2013; Park 2015b; Piravej 2012; Rodrigues 2016; Samuelkamaleshkumar 2014; Schick 2017; Ji 2014a; Nagapattinam 2015; Seok 2010; Thieme 2013; Tyson 2015; Wang 2015; Yoon 2014). Mirror therapy had a statistically significant effect on motor function in participants after stroke compared with all other types of interventions (SMD 0.47, 95% CI 0.27 to 0.67; 1173 participants; 36 studies; I^2 = 62%; Analysis 1.1).

Based on our sensitivity analysis for the influence of trial methodology, we found robust effects on motor function except for concealment of allocation. By analysing only those studies with adequate methods of concealment, the effect on motor function was not significant (Analysis 5.1). We therefore downgraded the quality of evidence to moderate, due to several ratings of unclear risk of bias.

Outcome 1.2: Motor impairment at the end of intervention phase

We included 39 studies in a pooled analysis of motor impairment after study end, with a total of 672 participants in the intervention and 620 in the control groups in the post-assessment data analysis (Acerra 2007; Alibakhshi 2016; Amasyali 2016; Arya 2015; Arya 2017; Cho 2015; Colomer 2016; Dohle 2009;Gurbuz 2016; In 2012; Invernizzi 2013; Kim 2014; Kim 2016; Kojima 2014; Kumar 2013; Kuzgun 2012; Lee 2012; Lee 2016; Lin 2014a; Lim 2016; Marquez 2012; Michielsen 2011; Mirela 2015; Mohan 2013; Piravej 2012; Rodrigues 2016; Samuelkamaleshkumar 2014; Schick 2017; Ji 2014a; Seok 2010; Sütbeyaz 2007; Tezuka 2006; Thieme 2013; Tyson 2015; Wang 2015; Wu 2013; Yavuzer 2008; Yun 2011; Yoon 2014). Mirror therapy has a statistically significant effect on motor impairment in participants after stroke compared with all other types of interventions (SMD 0.49, 95% CI 0.32 to 0.66; 1292 participants; 39 studies; I^2 = 53%; Analysis 1.2). The quality of evidence for motor impairment was moderate.

The effect was robust even after excluding studies with no or inadequate methods of allocation concealment (Analysis 5.2)

Outcome 1.3: Fugl-Meyer Assessment for the upper extremity at the end of intervention phase

Since 29 studies used the Fugl-Meyer Asssessment for analysing treatment effects on motor impairment, we analysed the effect on motor impairment for this outcome measure, using mean differences. We included 28 studies in a pooled analysis on Fugl-Meyer Assessment for the upper extremity after study end, with a total of 463 participants in the intervention and 435 in the control groups in the post-assessment data analysis (Alibakhshi 2016; Amasyali 2016; Arya 2015; Cho 2015; Colomer 2016; Dohle 2009; Gurbuz 2016; In 2012; Kim 2014; Kim 2015a; Kojima 2014; Kumar 2013; Kuzgun 2012; Lee 2012; Lin 2014a; Lim 2016; Michielsen 2011; Mirela 2015; Rodrigues 2016; Samuelkamaleshkumar 2014; Schick 2017; Ji 2014a; Tezuka 2006; Thieme 2013; Wang 2015; Wu 2013; Yun 2011; Yoon 2014). Mirror therapy had a statistically significant effect on Fugl-Meyer-Assessment in participants after stroke compared with all other types of interventions (MD 4.32, 95% CI 2.46 to 6.19; 898 participants; 28 studies; I^2 = 77%; Analysis 1.3). We rated the evidence for this outcome as of low quality.

Outcome 1.4: Activities of daily living at the end of the intervention phase

We included 19 studies in the analysis of the outcome of activities of daily living (Dohle 2009; Gurbuz 2016; Hiragami 2012; Invernizzi 2013; Kim 2014; Kim 2015a; Kojima 2014; Kuzgun 2012; Lim 2016; Lin 2014a; Pandian 2014; Park 2015a; Piravej 2012; Schick 2017; Sütbeyaz 2007; Thieme 2013; Wu 2013; Yavuzer 2008; Yoon 2014). These studies included 333 participants in the intervention and 289 in the control groups. Mirror therapy had a statistically significant effect on activities of daily living for participants with stroke, compared with all other interventions (SMD 0.48, 95% CI 0.30 to 0.65; 622 participants; 19 studies; I^2 = 15%; Analysis 1.4). We rated the evidence for this secondary outcome as of moderate quality.

Outcome 1.5: Pain at the end of the intervention phase

For analysing the effects of mirror therapy on pain at the end of the intervention, we included six studies presenting data on pain at rest or during movement (Acerra 2007; Cacchio 2009a; Cacchio 2009b; Dohle 2009; Michielsen 2011; Thieme 2013). These studies included 129 participants in the intervention and 119 in the control groups. Mirror therapy had a statistically significant effect on pain reduction for participants after stroke, compared with all other interventions (SMD −0.89, 95% CI −1.67 to −0.11; 248 participants; 6 studies; I^2 = 87%; Analysis 1.5). We rated the quality of the evidence for this secondary outcome pain as low.

However, two studies only included participants after stroke with a diagnosis of CRPS-type I, which might have influenced the effects of the intervention (Cacchio 2009a; Cacchio 2009b). We therefore performed a post hoc sensitivity analysis and removed the studies that only included participants with CRPS after stroke. After removing those two studies, we were left with four studies with 97 participants in the intervention and 79 in the control groups (Acerra 2007; Dohle 2009; Michielsen 2011; Thieme 2013). We found no statistically significant effect on pain for mirror therapy compared with all other interventions in this subgroup (SMD −0.23, 95% CI −0.53 to 0.08; 176 participants; 4 studies; I^2 = 0%; Analysis 6.1).

Outcome 1.6: Visuospatial neglect at the end of the intervention

Five studies reported outcome on visuospatial neglect (Dohle 2009; Moustapha 2012; Pandian 2014; Thieme 2013; Tyson 2015). These studies included 109 participants in the intervention and 66 in the control groups. Based on these data, we found a statistically non-significant effect of mirror therapy versus all other interventions on visuospatial neglect after stroke (SMD 1.06, 95% CI −0.10 to 2.23; 175 participants; 5 studies; I^2 = 89%; Analysis 1.6). We rated the quality of evidence for this secondary outcome as low.

Outcome 1.7: Motor function at follow-up after six months

Two studies provided data on motor function at a follow-up period of six months (Cacchio 2009a; Michielsen 2011). These studies included 44 participants each in the experimental and control groups. At follow-up after six months from the end of intervention, mirror therapy had a statistically non-significant effect on motor impairment in people after stroke, compared with all other interventions (SMD 1.20, 95% CI −0.78 to 3.18; 88 participants; 2 studies; I^2 = 94%; Analysis 1.7).

Outcome 1.8: Motor impairment at follow-up after six months

Three studies provided data on motor impairment at a follow-up period of six months (Michielsen 2011; Sütbeyaz 2007; Yavuzer 2008). These studies included 54 participants in the experimental and 55 in the control groups. At follow-up after six months from the end of intervention, mirror therapy had a statistically significant effect on motor function in people after stroke, compared with all other interventions (SMD 0.69, 95% CI 0.26 to 1.12; 109 participants; 3 studies; I^2 = 17%; Analysis 1.8).

Outcome 1.9: Dropouts at the end of intervention phase

We included 42 studies that provided data for the dropout rate at the end of the intervention phase in this analysis (Acerra 2007; Alibakhshi 2016; Altschuler 1999; Amasyali 2016; Arya 2015; Arya 2017; Cacchio 2009a; Cacchio 2009b; Colomer 2016; Dohle 2009; Hiragami 2012; In 2012; In 2016; Invernizzi 2013; Kawakami 2015; Kim 2014; Kim 2015a; Kojima 2014; Kuzgun 2012; Lee 2012; Lee 2016; Lim 2016; Lin 2014a; Marquez 2012; Michielsen 2011; Mohan 2013; Moustapha 2012; Pandian 2014; Piravej 2012; Rajappan 2016; Rodrigues 2016; Rothgangel 2004; Samuelkamaleshkumar 2014; Schick 2017; Nagapattinam 2015; Sütbeyaz 2007; Tezuka 2006; Thieme 2013; Tyson 2015; Wu 2013; Yavuzer 2008; Yun 2011). We found a statistically non-significant effect for dropping out in the mirror-therapy groups compared with the control groups (OR 1.14, 95% CI 0.74 to 1.76; 1438 participants; 42 studies; I^2 = 0%; Analysis 1.9).

Comparison 2: Subgroup analysis - upper versus lower extremity

Outcome 2.1: Motor function at the end of the intervention phase

We performed a subgroup analysis for those studies examining mirror therapy for the upper extremity (subgroup 2.1.1) and lower extremity (subgroup 2.1.2) (Analysis 2.1). We included 31 studies in the analysis of motor function after mirror therapy for the upper extremity. Studies included 553 participants in the experimental and 495 in the control groups (Acerra 2007; Alibakhshi 2016; Amasyali 2016; Bae 2012; Cacchio 2009a; Cacchio 2009b; Cho 2015; Colomer 2016; Dohle 2009; Hiragami 2012; In 2012; Invernizzi 2013; Kim 2014; Kim 2015a; Kim 2016; Kojima 2014; Lee 2012; Lin 2014a; Michielsen 2011; Park 2015b; Piravej 2012; Rodrigues 2016; Samuelkamaleshkumar 2014; Schick 2017; Ji 2014a; Seok 2010; Nagapattinam 2015; Thieme 2013; Tyson 2015; Wang 2015; Yoon 2014). We found a statistically significant effect of mirror therapy on motor function of the upper extremity for people after stroke compared to all other interventions (SMD 0.46, 95% CI 0.23 to 0.69; 1048 participants; 31 studies; I^2 = 66%; Analysis 2.1.1).

Five studies with 62 participants in the experimental and 63 in the control groups were included in the analysis for the lower extremity (Cha 2015; In 2016; Lee 2016; Marquez 2012; Mohan 2013). The positive effect of mirror therapy on motor function of the lower extremity for people after stroke compared with all other interventions was statistically significant (SMD 0.56, 95% CI 0.19 to 0.92; 125 participants; 5 studies; I^2 = 0%; Analysis 2.1.2). There was a statistically non-significant difference between subgroups.

Comparison 3: Subgroup analysis - sham intervention (covered mirror) versus other intervention (unrestricted view) versus no intervention

We found two different groups of control interventions. In all studies, participants in the control group performed the same movements as participants in the experimental groups. However, in one type of control intervention the view of the affected side was obscured with a covered mirror, or with the non-reflective side of the mirror (sham intervention). In the other type of control intervention participants had an unrestricted view of both; the unaffected and the affected limb (other intervention). Because we believed that this may have influenced the effect of therapy, we performed a subgroup analysis, differentiating between these two types of studies.

Outcome 3.1: Motor function at the end of the intervention phase

Sixteen studies with the outcome of motor function used a covered mirror in the control group (Acerra 2007; Cacchio 2009a; Cacchio 2009b; Cha 2015; Cho 2015; In 2016; Invernizzi 2013; Ji 2014a; Kim 2014; Marquez 2012; Mohan 2013; Nagapattinam 2015; Park 2015b; Piravej 2012; Rodrigues 2016; Thieme 2013). These studies included 281 participants in the intervention and 225 in the control groups. For this subgroup we found a statistically significant effect of mirror therapy on motor function after stroke (SMD 0.67, 95% CI 0.36 to 0.99; 506 participants; 16 studies; I^2 = 63%).

Fourteen studies with an intervention using an unrestricted view in the control groups, thus providing a view of both limbs, were analysed in this subgroup (Alibakhshi 2016; Amasyali 2016; Bae 2012; Colomer 2016; Dohle 2009; In 2012; Kim 2016; Lee 2016; Lin 2014a; Michielsen 2011; Schick 2017; Tyson 2015; Wang 2015; Yoon 2014). These studies included 259 participants in the experimental and 215 in the control groups. The effect of mirror therapy on motor function after stroke in these studies was not statistically significant (SMD 0.27, 95% CI −0.05 to 0.59; 474 participants; 14 studies; I^2 = 62%).

We included eight studies with no additional control therapy in this analysis (Amasyali 2016; Hiragami 2012; Kim 2015a; Kojima 2014; Lee 2012; Samuelkamaleshkumar 2014; Seok 2010; Wang 2015). Studies included 114 participants in the experimental and 105 in the control groups. This subgroup showed no statistically significant effect in favour of mirror therapy (SMD 0.57, 95% CI −0.02 to 1.15; 219 participants; 8 studies; I^2 = 75%; Analysis 3.1).

However, subgroup differences did not demonstrate statistical significance.

Comparison 4: Subgroup analysis: subacute versus chronic stage after stroke

In this subgroup analysis we differentiated between studies that included participants within six months (subacute stage) and those at more than six months after stroke (chronic stage). Eighteen studies with participants in the subacute stage after stroke were included in this analysis. We found a statistically significant effect of mirror therapy compared to all other interventions for this subgroup (SMD 0.45, 95% CI 0.18 to 0.73; 596 participants; 18 studies; I^2 = 59%). Fourteen studies in this analysis included participants in the chronic phase after stroke. The effect on motor function was also significant for this subgroup (SMD 0.43, 95% CI 0.06 to 0.81; 398 participants; 14 studies; I^2 = 68%; Analysis 4.1). Subgroup difference did not demonstrate statistical significance.

Comparison 5: Sensitivity analysis by trial methodology

We tested the robustness of the results by analysing only RCTs and excluding randomised cross-over trials, and by using specific methodological variables that could influence the observed treatment effects (randomisation procedure, concealment of allocation, blinding of assessors and ITT analysis; Analysis 5.1).

Outcome 5.1: Motor function at the end of the intervention phase

All studies without randomised cross-over trials

We included 35 studies in a subgroup analysis of all studies without randomised cross-over trials. The studies included 609 participants in the experimental and 551 in the control groups. Based on this analysis, mirror therapy had a statistically significant effect on motor function in people after stroke, compared to all other treatments (SMD 0.47, 95% CI 0.27 to 0.68; 1160 participants; 35 studies; I^2 = 63%; Analysis 5.1.1).

All studies with adequate sequence generation

We analysed 33 studies with 546 participants in the intervention and 459 in the control groups in this subgroup analysis of studies that we rated as having adequate sequence generation. We found a statistically significant effect of mirror therapy compared with all other therapies for people after stroke (SMD 0.36, 95% CI 0.19 to 0.54; participants = 1005; studies = 33; I^2 = 45%; Analysis 5.1.2)

All studies with adequate concealed allocation

We analysed 16 studies as having used an adequate method of allocation concealment. These studies included 313 participants in the experimental and 259 in the control groups. Based on this analysis, we found a non-significant effect of mirror therapy compared with all other therapies for people after stroke (SMD 0.21, 95% CI −0.04 to 0.47; 572 participants; 16 studies; I^2 = 51%; Analysis 5.1.3).

All studies with adequate intention-to-treat (ITT) analysis

We included 12 studies in our analysis of studies with an adequate ITT analysis. Based on our analysis of 204 participants in the experimental and 184 in the control groups with post-intervention data, mirror therapy had a significant effect on motor function compared with all other interventions (SMD 0.55, 95% CI 0.14 to 0.95; 388 participants; 12 studies; I^2 = 70%; Analysis 5.1.4).

All studies with blinded assessors

In this analysis we included 25 studies with 437 participants in the experimental and 383 in the control groups. Mirror therapy had a statistically significant positive effect on motor function compared with all other interventions (SMD 0.44, 95% CI 0.17 to 0.70; 820 participants; 25 studies; I^2 = 69%; Analysis 5.1.5).

Outcome 5.2: Motor impairment at the end of the intervention phase

All studies with adequate sequence generation

We analysed 36 studies with 620 participants in the intervention and 537 in the control groups in this subgroup analysis of studies that we rated as having adequate sequence generation. We found

a statistically significant effect of mirror therapy compared with all other therapies for people after stroke (SMD 0.46, 95% CI 0.29 to 0.63; 1157 participants; 36 studies; I^2 = 47%; Analysis 5.2).

DISCUSSION

Summary of main results

The main purpose of this review was to evaluate the effect of mirror therapy for improving motor function, motor impairment, activities of daily living, and reducing pain and visuospatial neglect for people after stroke. We included 62 studies (57 RCTs and five randomised cross-over studies), with a total of 1982 included participants that compared mirror therapy with other interventions. We found moderate-quality evidence that mirror therapy improves motor function and motor impairment and activities of daily living. Furthermore, with low-quality evidence we found reduced pain after stroke and improved motor impairment six months after the end of the intervention. However, after excluding studies that included participants with a complex regional pain syndrome only, we found no statistically significant effect on pain, based on moderate-quality evidence. Results for motor function after six months and for visuospatial neglect were not statistically significant and were of low-quality evidence. Acceptability of the intervention was high, without significantly more dropouts from the intervention groups compared with control groups, and with no reported adverse events during or after mirror therapy.

Fifty-two of the included studies evaluated the effect of mirror therapy on motor function of the upper extremity, and 10 studies evaluated the effect of mirror therapy on the lower extremity. Mirror therapy was effective in improving both upper and lower limb motor function.

Based on a subgroup analysis, we found statistically significant effects on motor function in those studies that compared mirror therapy with a sham intervention using a covered mirror (thus avoiding any view of the affected limb), but not in studies that used unrestricted view (no mirror or a transparent plexiglas) or no additional intervention in the control groups. However, there were no statistically significant differences between subgroups with different control interventions.

In a further subgroup analysis, we compared studies that included participants in the acute/subacute phase after stroke (within six months after stroke) and participants in the chronic phase (more than six months after stroke). Mirror therapy was effective for both subgroups of participants.

Overall completeness and applicability of evidence

Based on the available and included evidence, we were able to answer the research question, especially for the outcomes of motor function and motor impairment for the upper and lower extremity, as well as activities of daily living and pain. However, for visuospatial neglect, the number of studies and participants was low, so we could draw no final conclusion. Furthermore, we found some indications for a selective effect of mirror therapy on pain in participants with CRPS. However, this is based on only two studies, so we could draw no final conclusion. The positive results for motor impairment were consistent with follow-up assessment after six months, but not for motor function. The results are limited because our subgroup analysis indicates evidence of a greater effect of mirror therapy on motor function when compared with a sham intervention (using a covered mirror) than when compared with other (using unrestricted view) or no interventions. The positive effects in this review therefore at least indicate that mirror therapy as an adjunct to routine therapy can improve motor function for people after stroke. Furthermore, the effect on motor function was statistically significant both in acute/subacute and in chronic participants.

One of the potential advantages of mirror therapy compared with other interventions may be due to the possibility of training by moving the unaffected arm, or both arms, while looking in the mirror. Even people with severe paresis could therefore practise on their own without a therapist. Furthermore, mirror therapy could be applied at home, at least after inpatient training, as evaluated in five studies (Arya 2015; Manton 2002; Michielsen 2011; Pandian 2014; Rodrigues 2016).

Quality of the evidence

We used several methodological domains (adequate sequence generation, adequate concealment of allocation, adequate handling of missing outcome data and blinding of assessors) to assess the risks of bias in the included studies. We assessed nine studies as having unclear sequence generation. We found 33 studies with no or unclear use of concealed allocation of participants to study groups, 40 studies with no or unclear use of an adequate handling of missing outcome data, and 24 studies with no or unclear blinding of assessors. Results must therefore be interpreted with caution due to risks of bias. On this basis, we downgraded the quality of the evidence.

Some of the analyses showed significant heterogeneity. However, in the case of motor function and motor impairment this was no longer present when we excluded from the analysis those studies with unclear methods of sequence generation.

In order to test for potential biases through methodological issues, we performed a sensitivity analysis excluding randomised cross-over studies, studies with unclear adequacy of sequence generation, studies with inadequate concealment of allocation, studies not providing adequate handling of missing outcome data, and studies that did not use assessors blinded to the intervention. Based on these sensitivity analyses, the effects of mirror therapy on motor function for people after stroke were robust, except for studies with adequate methods of allocation concealment. For those studies, the effects on motor function, but not motor impairment, did not demonstrate statistical significance.

Additionally, overall limitations of the included studies were the small sample sizes of most studies and differences in study participants (e.g. severity of motor impairment) and therapy delivery between the studies (i.e. amount and frequency of the treatment period).

Potential biases in the review process

Through an extensive searching process, we are confident that we have identified all relevant studies in the field. However, there remains a risk of publication bias towards a selection of positive results. Furthermore, there is a small possibility of additional (published or unpublished) studies that we did not identify. As stated above, there was heterogeneity between studies in terms of trial design (i.e. parallel-group and cross-over trials, duration

of follow-up and selection criteria for participants), characteristics of participants (i.e. severity of motor impairment and time since stroke onset) and characteristics of interventions (i.e. total amount of time of therapy, percentage of the intervention dedicated to mirror therapy only, and therapy for upper or lower extremity). We also identified methodological limitations of studies. However, as stated above, a sensitivity analysis of methodological limitations and participant characteristics revealed the robustness of the results across the stated potential confounding factors, except for concealment of allocation. Blinding of therapists and participants would be an additional item in the 'Risk of bias' assessment, but we decided not to integrate this item, since blinding of therapists or participants appears not to be not practicable for the type of intervention in this review.

Agreements and disagreements with other studies or reviews

The results of this review are in line with the results of other reviews (Ezendam 2009; Rothgangel 2011). These reviews were systematic in terms of their methods. However, they had more limited search strategies, only included studies that were published before 2009, and did not use a pooled analysis of identified studies. A narrative review also describes positive effects of mirror therapy after stroke (Ramachandran 2009).

AUTHORS' CONCLUSIONS

Implications for practice

The results of this review indicate that there is moderate evidence for the effectiveness of mirror therapy for people after stroke in terms of improving motor function and motor impairment of the upper and lower extremity, as well as improving activities of daily living. The effects on motor function were more prominent when mirror therapy was compared to sham interventions. Mirror therapy could be applied as an additional intervention in the rehabilitation of people after stroke, but no clear conclusion could be drawn if mirror therapy replaced other interventions for improving motor function of the arm or leg, or both. No clear implication could be drawn for visuospatial neglect, since the positive results did not demonstrate statistical significance. Significant effects on pain were present in studies that included only participants with a CRPS-type I after stroke. For this subgroup of people, mirror therapy may therefore be an effective intervention for reducing pain.

Implications for research

The existing studies suggest an effect of mirror therapy after stroke, but they suffer from methodological problems such as small sample sizes and lack of proper reporting. There is thus an urgent need for well-designed and properly-reported multicentre randomised controlled studies with large sample sizes in order to provide a high level of evidence. Specifically, these studies should not deliver mirror therapy as an adjunct, but should compare it to other routinely-applied therapies. Further research should also address specific questions about the optimal dose, frequency, and duration of mirror therapy. Studies should answer questions about the effects of mirror therapy according to the extent of motor impairment, and should also focus on people with impairments other than motor impairments after stroke, such as pain and visuospatial neglect. Finally, it is important to update this review regularly in order to include studies that are ongoing at the time of publication.

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CHARACTERISTICS OF STUDIES

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

Acerra 2007

Methods	RCT
Participants	Country: Australia Setting: inpatient Age: adults (mean age: 68 years) Sample size: 40 participants (20 in each group) Sex: 22 women, 18 men Inclusion criteria: acute stroke (< 2 weeks) Exclusion criteria: previous stroke; vision or hearing impairment; acute trauma or impairment of the limbs; inability to sit supported in a high-backed chair for < 1 hour; MMSE < 22/30; major comorbidities
Interventions	2 arms 1. MT: participants were instructed to move both arms while looking in the mirror box, sensory stimulation 2. Sham therapy: participants performed the same treatment protocol as in group 1 but only viewing the unaffected arm 1 and 2: 5 days a week, 20 to 30 minutes for 2 weeks; additional usual rehabilitation programme Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline, after 2 weeks of treatment and 1 month after treatment 1. mAS (item 7 and 8, each 0 to 6) 2. Resting pain intensity (NRS 0 to 10); differential CRPS-type 1 diagnosis 3. grip strength (handheld dynamometer) 4. sensory detection (synchiria yes/no, QST) 5. adverse events
Notes	Unpublished data We used means and SDs of Item 7 of the mAS, and combined the scores on pain intensity of shoulder and hand Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement

Acerra 2007 *(Continued)*

Random sequence generation (selection bias)	Low risk	Computer-generated random number sequence
Allocation concealment (selection bias)	Low risk	Generated list was used by an independent person for group allocation
Incomplete outcome data (attrition bias) All outcomes	Low risk	Results were analysed on an ITT basis
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessors were blinded to group allocation

Alibakhshi 2016

Methods	RCT
Participants	Country: Iran Setting: inpatient hospital Age: adults (mean age: 50.9 years) Sample size: 24 participants (12 in each group, no dropouts published) Sex: 9 women, 15 men Inclusion criteria: stroke > 6 months, ability to understand treatment guidelines Exclusion criteria: any structural abnormalities that prevent the execution, any cognitive or perceptual deficit that can affect the implementation of treatment, visual deficits
Interventions	2 arms 1. Bilateral MT 2. Bilateral arm training without mirror 1 and 2: 3 weeks, 5 days a week, 30 minutes a day Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline, immediately after treatment and 1 month after treatment 1. FM-UE motor (0 - 66 points) 2. BBT 3. Jamar Dynamometer for grip strength
Notes	Published and unpublished information Funding source: Neuromuscular Rehabilitation Research Centre - Semnan University of Medical Sciences Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement

Alibakhshi 2016 *(Continued)*

Random sequence generation (selection bias)	Low risk	Randomisation with odd- and even-numbered cards
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessors were blinded to group allocation

Altschuler 1999

Methods	Randomised cross-over trial
Participants	Country: USA Setting: not stated Age: adults (mean age: 58.2 years) Sample size: 9 participants (9 in each group) Sex: 4 women, 5 men Inclusion criteria: at least 6 months post-stroke Exclusion criteria: not stated
Interventions	2 arms 1. 4 weeks of mirror therapy: participants were instructed to move the non-paretic arm while looking in the mirror and moving the paretic arm as best they could; followed by 4 weeks of control therapy, using transparent plastic instead of a mirror 2. Vice versa Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline, after 2, 4, 6 and 8 weeks 1. Self-developed scale (-3 to +3); assessing changes in participants' movement ability in terms of range of motion, speed and accuracy by video analysis
Notes	Data not included in the analysis Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Participants were randomly assigned (authors' statement)

Altschuler 1999 *(Continued)*

Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessors were blinded to group allocation

Amasyali 2016

Methods	RCT
Participants	Country: Turkey Setting: inpatient rehablitation centre Age: adults (mean age: 58.8 years) Sample size: 24 participants (9 in experimental group (2 dropped out at follow-up assessment); 8 in control group 1; 7 in control group 2 (1 dropped out at follow-up assessment) Sex: 11 women, 13 men Inclusion criteria: ischaemic stroke during the previous 12 months, between 20 and 85 years old, could understand simple verbal instructions (MMSE > 21), BRS between stage 2 and 5 for the hand, mAS < 3 Exclusion criteria: not stated
Interventions	3 arms 1, 2 and 3: conventional physiotherapy programme 1. Additional MT: unaffected wrist, hand flexion, extension and forearm circumduction, and supination–pronation movements, participants practised at home after supervised sessions 2. EMG-triggred electrical muscle stimulation of wrist and finger extensor muscles (pulse duration 200 µs, frequency 50 Hz, 1 sec ramp up, 5 sec biphasic stimulation, 1 sec ramp down; intensity was determined for each participant 3. No additional therapy 1, 2 and 3: 3 weeks, 5 days a week, 2 hours a day 1 and 2: additional 30 minutes a day Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline, after 3 weeks of treatment and 3 months after treatment 1. FM-UE motor (0 - 66 points) 2. Jamar Goniometer (wrist ROM) 3. Jamar Dynamometer for grip strength 4. BBT
Notes	Published and unpublished information Funding source: not stated

Amasyali 2016 *(Continued)*

	Declarations of trialists' interests: there are no conflicts of interest

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by computer-generated random-number sequence
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants analysed as assigned to groups (authors' statement)
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessor was blinded to group allocation

Arya 2015

Methods	RCT
Participants	Country: India Setting: inpatient hospital, home after discharge Age: adults (mean age: 45.6 years) Sample size: 33 participants (17 in experimental group, 16 in control group, 1 dropout) Sex: 8 women, 25 men Inclusion criteria: aged < 60 years, single unilateral stroke with hemiparesis, more than 24 weeks post-stroke, able to understand instructions, Brunnstrom recovery stage of arm (BRS-A) 2 or above Exclusion criteria: associated neurological complications, severe perceptual and visual deficits (as evaluated by the National Institutes of Health Stroke Subscales and clinical tests: copying and drawing, line-bisection, cancellation tasks, and functional performance), shoulder subluxation, uncontrolled medical illness
Interventions	2 arms 1 and 2: usual occupational therapy using principles of Brunnstrom and Bobath approaches 1. MT: participants observed mirror image of task-specific movements of the less affected upper limb, each task 20 to 100 times in an increment of 5 to 10 a session 1: 8 weeks, 5 days a week, 45 minutes MT, additional 45 minutes usual occupational therapy 2: 8 weeks, 5 days a week, 90 minutes usual occupational therapy Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and after 8 weeks of treatment 1. BRS (Arm and Hand) 2. FM-UE motor (0 - 66 points)

Arya 2015 *(Continued)*

Notes	Information partly based on authors' information Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned (authors' statement), computer-generated random-number sequence
Allocation concealment (selection bias)	Low risk	Concealed allocation by numbered sealed envelopes
Incomplete outcome data (attrition bias) All outcomes	Low risk	ITT using 'last measure carried forward' method
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessors were blinded to group allocation

Arya 2017

Methods	RCT
Participants	Country: India Setting: inpatient rehabilitation centre Age: adults (mean age: 46.4 years) Sample size: 36 participants (19 in experimental group, 17 in control group; 6 dropouts) Sex: 6 women, 30 men Inclusion criteria: post-stroke hemiparesis due to unilateral stroke; post-stroke duration > 6 months; paresis of either right or left side; age range between 30 and 60 years; functional ambulation classification (FAC) level 2 and above; ability to walk for a distance of at least 10 metres without any orthosis and walking device Exclusion criteria: any other associated neurological disorder; severe cognitive, perceptual and visual deficits (evaluated by the National Institutes of Health Stroke Subscales and copying, drawing, line bisection, cancellation, and functional tasks); cardiovascular instability; any musculoskeletal disorder affecting locomotion
Interventions	2 arms 1 and 2: conventional rehabilitation programme 1. Activity-based MT: activities of the unaffected lower limb, ball rolling, rocking-on-board, wiping, pedaling, and shifting 1: 3 to 4 weeks, 30 sessions, 30 minutes MT and 30 minutes conventional rehabilitation programme 2: 3 to 4 weeks, 30 sessions, 60 minutes conventional rehabilitation programme

Arya 2017 *(Continued)*

	Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and after 3 months 1. Brunnstrom recovery stages- lower extremity 2. Fugl-Meyer-Assessment- lower extremity 3. Rivermead visual gait assessment 4. 10 metre walk test
Notes	Information based on abstract and authors' information, full-text publication received in 2017 Funding source: Pandit Deendayal Upadhayaya National Institute for Persons with Physical Disabilities, 4 VD Marg, New Delhi-110002, India Declarations of trialists' interests: no potential conflict of interest

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned (authors' statement), computer-generated (SPSS software) random-number sequence
Allocation concealment (selection bias)	Low risk	Concealed allocation by sealed envelopes (authors' statement)
Incomplete outcome data (attrition bias) All outcomes	Low risk	ITT using 'last measure carried forward' method (authors' statement)
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessors, participants, and therapists were blinded to group allocation (authors' statement)

Bae 2012

Methods	RCT
Participants	Country: Republic of Korea Setting: inpatient rehabilitation centre Age: adults (mean age: 53.9 years) Sample size: 20 (10 in each group; no dropouts published) Sex: 7 women, 13 men Inclusion criteria: onset of stroke within 6 months Exclusion criteria: did not understand treatment method of the study, MMSE < 16, visual impairment, damage on musculoskeletal system or peripheral nerve on paretic side, mAS score > 2, Brunnstrom recovery stage 1, 5 or 6
Interventions	2 arms 1 and 2: usual rehabilitation treatment and additional:

Bae 2012 *(Continued)*

	1. MT: participants observed their unaffected upper limb in mirror while performing movements of both arms, 5 exercises for 6 minutes, 5 times a session 2. Sham therapy: participants performed the same treatment protocol as in group 1 but only for the paretic arm 1 and 2: 4 weeks, 5 days a week, 30 minutes MT or sham therapy Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and after 4 weeks 1. MFT (0 - 32 points, higher score indicate better motor function) 2. Brain waves using QEEG-8
Notes	Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by cards composed of odd and even numbers
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) primary outcome	Unclear risk	Not stated

Bahrami 2013

Methods	RCT
Participants	Country: Iran Setting: not stated Age: adults (age not stated) Sample size: 50 participants (25 in each group, no dropouts published) Sex: not stated Inclusion criteria: 1st unilateral stroke (ischaemic or haemorrhagic verified by CT-scan or MRI), between 1 month and 1 year after stroke, Brunnstrom recovery stages 1 - 3 Exclusion criteria: severe cognitive deficit, severe aphasia, visual deficits, dementia, not able to understand instructions, did not participate in 4 sessions or 2 consecutive sessions
Interventions	2 arms 1 and 2: physiotherapy and neuromuscular stimulation

Bahrami 2013 *(Continued)*

	1. MT: participants observed movements of healthy upper and lower extremities in front of the mirror 2. No additional therapy 1 and 2: 20 sessions, 3 to 5 days a week, 30 minutes 1: 20 sessions, 3 to 5 days a week, additional 30 minutes MT Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and after the 5th, 10th, and 15th session 1. BI (0 - 100)
Notes	Information based on abstract, partly translated from Persian language Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by coin tossing
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) primary outcome	Unclear risk	Not stated

Cacchio 2009a

Methods	RCT
Participants	Country: Italy Seting: inpatient and outpatient rehabilitation centre Age: adults (mean age: 58.4 years) Sample size: 48 participants (24 in each group; 6 dropped out post-treatment, 3 more dropped out after 6 months) Sex: 26 women, 22 men Inclusion criteria: hemiparesis after first-ever ischaemic or haemorrhagic stroke; during 1st 6 months post-stroke; diagnosed with CRPS-type 1 with a VAS pain score > 4 cm Exclusion criteria: intra-articular injection into the affected shoulder during the previous 6 months or use of systemic corticosteroids during the previous 4 months; presence of another explanation of pain; prior surgery to shoulder or neck; serious uncontrolled medical conditions; global aphasia or cognitive

Cacchio 2009a *(Continued)*

	impairments; visual impairments which might interfere with the aims of the study; evidence of recent alcohol or drug abuse; or severe depression
Interventions	2 arms: 4-week conventional stroke rehabilitation programme and additional: 1. MT: participants performed upper extremity movements while looking in the mirror, without additional verbal feedback 2. Sham therapy: participants performed the same treatment protocol as in group 1 but with covering the reflecting side of the mirror 1 and 2: 5 days a week, 30 minutes of therapy for the 1st 2 weeks; and 5 days a week, 60 minutes of therapy for the last 2 weeks Date of intervention: October 2000 to December 2006
Outcomes	Outcomes were recorded at baseline, 1 week after the intervention period and after 6 months 1. WMFT/FA; 0 to 5, lower scores indicating better functioning 2. WMFT/PT; in seconds 3. QOM item in the MAL (0 to 5) 4. Pain at rest (VAS 0 to 10) 5. Pain on movement (VAS 0 to 10) 6. Pain tactile allodynia (VAS 0 to 10)
Notes	Published and unpublished data Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Participants were randomly allocated (authors' statement)
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Low risk	Results were analysed on an ITT basis
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessors were blinded to group allocation

Cacchio 2009b

Methods	RCT
Participants	Country: Italy Setting: inpatient and outpatient rehabilitation centre Age: adults (mean age: 62 years)

Cacchio 2009b *(Continued)*

	Sample size: 24 participants (8 in each group) Sex: 13 women, 11 men Inclusion criteria: 1st ischaemic or haemorrhagic stroke (> 6 months); diagnosis of CRPS-type 1 (pain VAS > 4 cm) Exclusion criteria: intra-articular shoulder injection in the previous 6 months or systemic corticosteroid in the previous 4 months; another obvious explanation for pain; prior surgery to shoulder or neck region; serious uncontrolled medical conditions; global aphasia or cognitive impairments interfering with understanding instructions, motor testing and treatment; visual impairments interfering with aims of the study; evidence of recent alcohol or drug abuse; or severe depression
Interventions	3 arms 1. MT: participants performed cardinal upper extremity movements while looking in the mirror 2. Sham therapy: participants performed the same treatment protocol as in group 1 but with covering the reflecting side of the mirror 3. Mental imagery: participants performed mental imagery 1, 2 and 3: 5 days a week; 30 minutes of therapy for 4 weeks Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and after the intervention period 1. WMFT/FA: 0 to 5, lower scores indicating better functioning 2. WMFT/PT: in seconds 3. Pain (VAS 0 to 10) 4. Brushed induced allodynia 5. Oedema
Notes	Published and unpublished data; we only analysed the 1st intervention period (4 weeks); we combined groups 2 and 3 into 1 control group Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Block randomisation; cards composed with random-numbers method
Allocation concealment (selection bias)	Low risk	A therapist not involved in the treatments opened sealed envelopes and assigned appointments according to treatment group (authors' statement)
Incomplete outcome data (attrition bias) All outcomes	Low risk	Results were analysed on an ITT basis
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessors were blinded to group allocation

Cha 2015

Methods	RCT
Participants	Country: Republic of Korea Setting: not stated Age: adults (mean age: 58.7 years) Sample size: 36 participants (19 in experimental group, 17 in control group, no dropouts published) Sex: 17 women, 19 men Inclusion criteria: stroke onset duration of > 6 months; no neurological deficits in the cerebellum or the brainstem; no hemineglect or visual field deficits; no cognitive problems (> 24 points in the MMSE); independent walking (with or without walking aids) Excludion criteria: not stated
Interventions	2 arms 1. MT + rTMS: activities with the unaffected limb; flexing and extending the hip, knee, and ankle at a self-selected speed under supervision but without additional verbal feedback; 10 minutes of rest period in the middle of the session; rTMS- 70 mm coil and a Magstim Rapid (Magstim, Wales, UK) 1 Hz rTMS was applied for 20 minutes to the hotspot of the lesional hemisphere in 10-second trains, with 50-second intervals between the trains 2. Sham therapy + rTMS: same therapy protocol, except the mirror was covered; rTMS: 70 mm coil and a Magstim Rapid (Magstim, Wales, UK) 1 Hz rTMS was applied for 20 minutes to the hotspot of the lesional hemisphere in 10-second trains, with 50-second intervals between the trains 1 and 2: 4 weeks, 5 days a week, 40 minutes (20 minutes rTMS and 20 minutes MT or sham therapy) Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and after the 4 weeks of therapy: 1. Berg-Balance-Scale 2. Balance Index 3. Timed-up and go test 4. Dynamics limits of stability
Notes	Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Randomisation by blindly drawing 1 card out of an envelope containing 2 cards that were each marked as experimental group and control group
Allocation concealment (selection bias)	Low risk	Concealment by sealed envelopes
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated; no dropouts
Blinding of outcome assessment (detection bias)	Low risk	Assessors were blinded to group allocation

Cha 2015 *(Continued)*

primary outcome

Cho 2015

Methods	RCT
Participants	Country: Republic of Korea Setting: not stated Age: adults (mean age: 59.3 years) Sample size: 27 participants (14 in experimental group, 13 in control group, no dropouts published) Sex: 12 women, 15 men Inclusion criteria: stroke with hemiplegic symptoms, a score of 24 or higher on the MMSE-K, stroke onset more than 6 months earlier Exclusion criteria: orthopaedic or neurological disease history
Interventions	2 arms 1 and 2: tDCS 1: MT: participants performed movements of both upper limbs, 10 sets, 20 repetitions of each motion, 2-minute rest between sets 2: sham therapy: participants performed the same exercises with non-reflective surface between limbs 1 and 2: 6 weeks, 3 days a week, 20 minutes tDCS + 5 minutes rest + 20 minutes MT or sham therapy Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and after the 6 weeks of therapy 1. BBT 2. Grip strength 3. Jebsen-Taylor test (in seconds) 4. FM-UE motor (0 - 66)
Notes	Funding source: Wonkwang Health Science University Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned (authors' statement)
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated

Cho 2015 *(Continued)*

Blinding of outcome assessment (detection bias) primary outcome	Unclear risk	Not stated

Colomer 2016

Methods	RCT
Participants	Country: Spain Setting: outpatient rehabilitation centre Age: adults (mean age: 53.5 years) Sample size: 34 (17 in experimental group (2 dropped out); 16 in control group (1 dropped out)) Sex: 5 women, 26 men Inclusion criteria: stroke > 6 months, BRS 1 or 2, FM-UE < 19, sensory impairment assessed by clinical examination, able to maintain sitting position for at least 60 minutes, MMSE > 23 Exclusion criteria: impaired comprehension that hindered understanding of instructions (Mississippi Aphasia screening < 45), upper limb pain that limited participation in rehabilitation protocol, spatial neglect, self-awareness disorder, emotional circumstances that impeded adequate collaboration
Interventions	2 arms 1 and 2: usual physical therapy: 1. MT: participants observed their unaffected upper limb in mirror while performing movements with less affected upper limb: flexion-extension of shoulder, pronation and supination of forearm, fine and gross motor tasks with and without objects (balls, cups) 2. Control group: passive mobilisation of affected upper limb 1 and 2: 8 weeks, 5 days a week, 60 minutes each, additional 3 days a week, 45 minutes a session MT or passive mobilisation Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and after 8 weeks of intervention 1. WMFT 2. FM-UE 3. NSA
Notes	Published information Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by computer-generated random-number sequence

Colomer 2016 *(Continued)*

Allocation concealment (selection bias)	Low risk	Concealed allocation by sealed envelopes and independent investigator
Incomplete outcome data (attrition bias) All outcomes	High risk	No ITT analysis was performed
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessor was blinded to group allocation

Dalla Libera 2015

Methods	RCT
Participants	Country: Switzerland Setting: not stated Age: adults (age not stated) Sample size: 10 participants (no dropouts published) Sex: not stated Inclusion criteria: 3 months after stroke; severe disability (NIHSS 10 - 14), hand paresis Exclusion criteria: not stated
Interventions	2 arms 1 and 2: TMS: double-pulse TMS through a figure-eight focal coil for bilateral intracortical inhibition in primary motor at rest and during movement preparation 1. Additional MT 2. No additional therapy 1 and 2: 4 weeks, 3 days a week, 15 minutes TMS 1: additional 15 minutes MT Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and after therapy period 1. MRC Scale for Muscle Strength 2. BRS 3. FM-UE 4. FAB 5. Beck Depression Scale 6. 10-item Spiegelberger Trait Anger Scale 7. MoCA 8. Functional Independence Measure (FIM)
Notes	Information based on authors' information and abstract Funding source: not stated

Dalla Libera 2015 *(Continued)*

	Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned (authors' statement)
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) primary outcome	Unclear risk	Not stated

Dohle 2009

Methods	RCT
Participants	Country: Germany Setting: inpatient rehabiltation centre Age: aduts (mean age: 56.5 years) Sample size: 48 participants (24 in each group, 12 dropped out) Sex: 10 women, 26 men Inclusion criteria: first-ever ischaemic stroke in the territory of the middle cerebral artery; not more than 8 weeks post-stroke; between 25 and 80 years old; able to follow therapy instructions; capable of participating in 30-minute daily therapy sessions Exclusion criteria: experienced previous stroke; major haemorrhagic changes; increased intracranial pressure; hemicraniectomy or orthopaedic, rheumatologic, or other diseases interfering with their ability to sit or to move either upper limb
Interventions	2 arms 1. MT: participants were instructed to move both arms "as well as possible" while looking in the mirror 2. Bilateral arm training: participants performed the same treatment protocol as in group 1 but without a mirror 1 and 2: 5 days a week; 30 minutes of therapy for 6 weeks Date of intervention: October 2004 to April 2006
Outcomes	Outcomes were recorded at baseline and after the intervention 1. FM-UE motor, ROM, pain and sensory section (FM-UE 0 to 126) 2. ARAT 0 to 57 3. FIM self-care and mobility items (7 to 77) 4. self-defined Neglect score (0 to 4)

Dohle 2009 *(Continued)*

Notes	Published and unpublished data; we extracted the motor section of the FM-UE (without reflex activity, 0 to 60) Funding source: rehabilitation research network (refonet) of the German Pension Scheme Rhineland Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Sealed, numbered envelopes were created
Allocation concealment (selection bias)	Low risk	Sealed envelopes were broken after study inclusion
Incomplete outcome data (attrition bias) All outcomes	High risk	Dropouts were not included in analysis
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessors of primary outcome were blinded to group allocation

Geller 2016

Methods	RCT
Participants	Country: USA Setting: outpatient (at home) Age: adults (34 to 73 years old) Sample size: 6 participants (4 in 2 experimental groups, 2 in control group; dropouts not published) Sex: 3 women, 3 men Inclusion criteria: first-time unilateral stroke occurring at least 3 months prior with FMA-UE scores between 10 and 50 Exclusion criteria: not stated
Interventions	3 arms 1 - 3 : occupational therapy (OT) 1. Bimanual MT as home programme 2. Unimanual MT as home programme 3. Traditional OT as home programme 1 - 3: 6 weeks, 2 times a week OT in the clinic 1 - 3: 6 weeks, 5 days a week, 30-minute home programme bimanual MT, unimanual MT or traditional OT Date of intervention: not stated

Geller 2016 *(Continued)*

Outcomes	Outcomes were recorded 1. FM-UE 2. ARAT 3. Stroke Impact Scale
Notes	Information based on abstract Funding source: not stated Declarations of trialists' interests: there are no conflicts of interest

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not stated
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) primary outcome	Unclear risk	Not stated

Gurbuz 2016

Methods	RCT
Participants	Country: Turkey Setting: inpatient rehabiltation centre Age: adults (mean age: 60.9 years) Sample size: 31 (16 in experimental group, 15 in control group, no dropouts published) Sex: 14 women, 17 men Inclusion criteria: unilateral hemiplegia due to first-ever stroke (verified by CT or MRI); < 6 months; BRS for the upper extremity between I and IV; MMSE 24 and above; lack of excessive spasticity in the joints of the affected upper extremity (stage 2 and below according to the mAS) Exclusion criteria: joint movement limitations in the healthy upper extremity; a visual field defect or neglect syndrome; and those who had previously undergone a rehabilitation programme
Interventions	2 arms 1 and 2: upper extremity rehabilitation programme 1. Additional mirror therapy: activities of the affected limb; flexion and extension of the wrist and finger 2. Additional sham therapy: same therapy protocol with a covered mirror 1 and 2: 4 weeks, 5 times a week, 60 to 120 minutes upper extremity rehabilitation programme

Gurbuz 2016 *(Continued)*

	1 and 2: 4 weeks, 5 times a week, 20 minutes MT or sham therapy Date of intervention: July 2013 to July 2014
Outcomes	Outcomes were recorded at baseline and after 4 weeks of therapy 1. FMA-UE 2. FIM self-care subscale (Turkish version)
Notes	Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by random-number table
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated; no dropouts published
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessor was blinded to group allocation

Hiragami 2012

Methods	RCT
Participants	Country: Japan Setting: inpatient hospital Age: adults (mean age: 67.5 years) Sample size: 14 participants (7 in each group, no dropouts published) Sex: 6 women, 8 men Inclusion criteria: 1st episode of stroke with hemiparesis or second episode of stroke with no upper limb motor dysfunction after 1st stroke, > 1 month since stroke, Brunnstrom recovery stage finger 1 - 5, no severe cognitive disorders (MMSE score ≥ 24, and item score of consciousness, gaze, visual fields, language, attention of National Institutes of Health Stroke scale = 0) Exclusion criteria: hypertonia of upper limb, limitation in range of motion of upper limb, other diseases interfering with ability to move upper limbs
Interventions	2 arms 1 and 2: conventional stroke rehabilitation programme (physiotherapy, occupational therapy)

Hiragami 2012 *(Continued)*

	1. Additional MT: non-paretic-side movements (e.g. supination and eversion of the forearm, flexion and extension of the wrist and finger, grasp a block) while participants looked into the mirror. During the session participants were asked to try to do the same movements with the paretic hand 2. No additional therapy 1 and 2: 4 weeks, 6 - 7 days a week, daily 2 hours 1: additional 30 minutes MT Date of intervention: October 2010 to March 2011
Outcomes	Outcomes were recorded at baseline and after 4 weeks of therapy 1. BRS 2. FM-UE 3. WMFT 4. FIM self-care
Notes	Published and unpublished information Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by stratified randomisation
Allocation concealment (selection bias)	Low risk	Concealed allocation by an independent author who drew sealed envelopes
Incomplete outcome data (attrition bias) All outcomes	Low risk	No dropouts and group changes
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessor was blinded to group allocation

In 2012

Methods	RCT
Participants	Country: Republic of Korea Setting: inpatient rehabilitation centre Age: adults (mean age: 63.9 years) Sample size: 24 participants (14 in experimental group, 10 in control group; 5 dropouts) Sex: 8 women, 11 men Inclusion criteria: onset of stroke at least 6 months prior to study, able to understand and follow simple verbal instructions, MMSE > 21, Brunnstrom stages 1 - 4

In 2012 *(Continued)*

	Exclusion criteria: apraxia, hemineglect, orthopaedic conditions or digital neuropathy in upper extremities
Interventions	2 arms 1 and 2: conventional stroke rehabilitation programme 1. Additional Virtual MT: affected arm lay in a box with a monitor positioned on the box, the unaffected arm was positioned under a camera, looking on the screen while performing movements of both arms, supervision of caregivers 2. Additional sham therapy (same treatment, but the monitor was off) 1 and 2: 4 weeks, 5 days a week, 30 minutes additional virtual reality (VR) reflection therapy or additional sham therapy Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and after 4 weeks 1. FM-UE (0 - 66) 2. Modified Ashworth Scale 3. BBT 4. JTHFT 5. MFT
Notes	Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by computer-generated random sequence
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	High risk	Dropouts were not included in analysis
Blinding of outcome assessment (detection bias) primary outcome	Unclear risk	Not stated

In 2016

Methods	RCT
Participants	Country: Republic of Korea Seting: inpatient rehabilitation centre Age: adults (mean age: 55.9 years) Sample size: 30 participants (15 in experimental group and 15 in control group; 5 dropouts)

In 2016 *(Continued)*

	Sex: 10 women, 15 men Inclusion criteria: onset of stroke at least 6 months prior to study; were able to understand and follow simple verbal instructions; had a MMSE score over 21; had a Brunnstrom score between stages I and IV Exclusion criteria: had no apraxia or hemineglect; had no orthopaedic and neurologic conditions such as fractures and digital neuropathy on their lower extremities
Interventions	2 arms 1 and 2: conventional stroke rehabilitation programme 1. Additional Virtual MT: affected leg stood in a box with a monitor positioned on the box, the unaffected leg was positioned under a camera, looked on the screen while performing movements of both legs, supervision of caregivers 2. Additional sham therapy (same treatment, but the monitor was off) 1 and 2: 4 weeks, 5 days a week, 30 minutes conventional stroke rehabilitation programme 1 and 2: 4 weeks, 5 days a week, 30 minutes additional virtual reality (VR) reflection therapy or additional sham therapy Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and after 4 weeks: 1. BBS 2. FRT 3. TUG 4. 10-metre walking velocity 5. Static balance ability (variation: eyes open or eyes closed; sway distance in cm)
Notes	Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by computer-generated random sequence
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	High risk	Dropouts were not included in analysis
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessors were blinded to the participants' groups

Invernizzi 2013

Methods	RCT

Invernizzi 2013 *(Continued)*

Participants	Country: Italy Setting: inpatient rehabilitation centre Age: adults (mean age: 66.6 years) Sample size: 26 (13 in each group; 1 dropped out) Sex: 9 women, 17 men Inclusion criteria: hemiplegia after 1st stroke (diagnosed by CT scan) within 4 weeks post-stroke, absence of severe attentive deficits, presence of movement in shoulder/elbow/hand with Motricity score < 77; Exclusion criteria: haemorrhagic stroke, global aphasia and cognitive impairments that interfere with study or treatment participation (MMSE < 22), concomitant cns- or pns-disorder or myopathia
Interventions	2 arms: usual rehabilitation programme 1 hour, 5 times a week, additional: 1. MT: participants observed their unaffected upper limb in mirror while performing movements of the unaffected limb, self-selected speed, no additional verbal feedback 2. Sham therapy: participants performed the same treatment protocol with a covered mirror 1 and 2: 5 days a week, 30 minutes of MT or sham therapy for 1st 2 weeks, 60 minutes of MT or sham therapy for the last 2 weeks Date of intervention: October 2009 to August 2011
Outcomes	Outcomes were recorded and reported at baseline and after 4 weeks 1. ARAT 2. MI-UL 3. FIM
Notes	Published and unpublished information Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by computer-generated random sequence
Allocation concealment (selection bias)	Low risk	Concealed allocation by an independent investigator
Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants analysed as allocated (authors' information)
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessor was blinded to group allocation

Ji 2014a

Methods	RCT
Participants	Country: Republic of Korea Setting: university hospital Age: adults (mean age: 52.6 years) Sample size: 35 participants (12 in experimental group 1, 11 in experimental group 2, 12 in control group, no dropouts published) Sex: 13 women, 22 men Inclusion criteria: hemiparesis by stroke Exclusion criteria: not stated
Interventions	3 arms 1, 2 and 3: traditional physiotherapy 1. Additional MT with rTMS: flexion and extension of fingers, 10 Hz rTMS was applied to the hotspot of the lesional hemisphere in 10-second trains, with 50-second intervals between trains 2. Additional MT: flexion and extension of fingers wrist extension of non-paretic upper extremity consisting of daily 4 times for 15 minutes a session 3. Sham therapy using a covered mirror: same movements as in MT 1, 2, and 3: 6 weeks, 5 days a week, 30 minutes a session physiotherapy 1, 2, and 3: additional 15 minutes a day MT or sham therapy Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and after 6 weeks of therapy 1. Motor-evoked potentials 2. FM-UE 3. BBT
Notes	Information based on published article Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by computer-generated random-number blocks
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias)	Low risk	Assessor was blinded to group allocation

Ji 2014a *(Continued)*

	primary outcome

Kawakami 2015

Methods	RCT
Participants	Country: Japan Setting: inpatient rehabilitation centre Age: adults (mean age: 64.1 years) Sample size: 81 participants (19 in group 1 (3 dropped out), 25 in group 2 (6 dropped out), 17 in group 3 (2 dropped out),11 in group 4 (2 dropped out), 9 in group 5 (1 dropped out)) Sex: 24 women, 43 men Inclusion criteria: hemiplegia following initial supratentorial stroke, admitted to a convalescent rehabilitation ward Exclusion criteria: time to admission from the onset is within 14 days, difficult communication due to severe cognitive disorder, comorbidity index of 4 or higher, necessity of high-level consideration and caution for rehabilitation, and scores of hip-flexion, knee-extension, and foot-pat items of the Stroke Impairment Assessment Set (SIAS) lower than 2
Interventions	5 arms 1 to 5: standard rehabilitation programme 1. MT: dorsiflexion of the ankle joint, stepping over, and abduction/adduction of the hip joint with the non-affected limb 2. Integrated volitional control electrical stimulation (IVES): 50 μs pulse width, 20 Hz frequency bidirectional square waves was applied at an intensity proportional to the voluntary myoelectric activity level on the paralytic side for dorsiflexion of the ankle joint and extension of the knee joint 3. Therapeutic electrical stimulation (TES): 50 μs pulse width, 20 Hz frequency bidirectional square waves applied at the maximum acceptable intensity during 10 minutes each of paralytic ankle dorsiflexion and knee extension 4. Repetitive facilitating exercises (RFE): participants performed ankle dorsiflexion 100 or more times during a 10-minute period in a supine position using manual tapping stimulation, additional performance of hip flexion-extension exercise, abduction-adduction exercise, extension/abduction-flexion/adduction exercise, and hip extension/abduction/retention of external rotation/knee extension-hip flexion/adduction/external rotation/knee flexion exercise 5. Control group: training programme of ROM and ADL exercises 1 to 5: 4 weeks, 1 hour a day standard rehabilitation programme 1 to 5: 20 minutes within conventional physiotherapy Date of intervention: September 2009 to July 2011
Outcomes	Outcomes were recorded at baseline and after 4 weeks of therapy 1. Stroke Impairment Assessment Set (SIAS)
Notes	Information based on published article Funding source: not stated Declarations of trialists' interests: not stated

Kawakami 2015 *(Continued)*

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by table of random numbers
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) primary outcome	Unclear risk	Not stated

Kim 2014

Methods	RCT
Participants	Country: Republic of Korea Setting: university hospital Age: adults (mean age: 55.8 years) Sample size: 27 (14 in experimental group, 13 in control group, 4 dropouts) Sex: 9 women, 14 men Inclusion criteria: onset of stroke within 6 months, MMSE > 21, FMA upper extremity score < 44, Brunnstrom recovery stage 1 - 4, absence of orthopaedic disease in the upper extremity, no visual perception disorder (unilateral neglect, hemianopsia, apraxia), no pacemaker, no anticonvulsant medication, medically stable condition Exclusion criteria: not stated
Interventions	2 arms 1 and 2: usual rehabilitation treatment 1. Additional MT and FES: participants observed their unaffected upper limb in a mirror while performing extension of wrist and fingers to lift the hand from an FES switch, at the same time attempt to extend affected hand supported by electrical stimulation (20 Hz), pulse rate 300 μs, individual intensity for muscle contraction and complete extension 2. Additional sham therapy and FES: participants performed the same treatment protocol as in group 1 while looking on the non-reflecting surface of the mirror 1 and 2: 60 minutes/day, 5 times/week, 4 weeks usual rehabilitation treatment 1 and 2: additional 5 days a week, 30 minutes a day, 4 weeks MT or sham therapy Date of intervention: 1 July to 31 July 2013
Outcomes	Outcomes were recorded and reported at baseline (t1), after 4 weeks of treatment (t2) 1. FM-UE motor (0 - 66 points)

Kim 2014 *(Continued)*

2. Brunnstrom recovery stages
3. BBT
4. MFT

Notes	Funding source: Sahmyook University Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by computer-generated random sequence
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Outcome assessors were blinded to group allocation

Kim 2015a

Methods	RCT
Participants	Country: Republic of Korea Setting: inpatient rehabilitation centre Age: adults (mean age: 57.7 years) Sample size: 33 participants (20 in 2 experimental groups, 9 in control group; 4 dropouts) Sex: 9 women, 20 men Inclusion criteria: onset of stroke > 6 months, MMSE > 25, absence of cognitive problems, BRS 1 – 4, and the ability to understand the purpose of the study Exclusion criteria: impaired vision, cognitive problems such as a severe decline in cognition or aphasia that would prevent normal progress in the experiment, neurological or musculoskeletal (fracture or balance-related) disorders not caused by stroke, hemineglect
Interventions	3 arms 1, 2 and 3: conventional rehabilitation programme 1. Additional MT with BF-FES: EMG placed to wrist extensor and brachial muscle of the upper extremity of the less affected side, FES electrode placed to wrist extensor of the affected side, input signal for EMG sensor sampled at 256 Hz, 5 s of electrical stimulation of the affected side after exceeding EMG threshold, MT with physiological and object-related movements 2. Additional MT with FES: FES adjusted to a tolerable level while the participants were in a state of induced wrist extension every 5 s 3. No additional therapy

Kim 2015a *(Continued)*

	1, 2 and 3: 4 weeks, 5 days a week, 30 minutes a day 1 and 2: additional 4 weeks, 5 days per week, 30 minutes a session Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and after 4 weeks of therapy 1. Muscle strength with hand-held dynamometer (wrist flexion and extension, elbow flexion and extension) 2. ROM (wrist flexion and extension, elbow flexion and extension) 3. mAS of wrist flexion, elbow flexion and extension 4. Palmar grasp strength (electrodynamometer) 5. BBT 6. JTHFT 7. FIM 8. SSQOL
Notes	Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by computer-generated random-number sequence
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	High risk	Dropouts not analysed
Blinding of outcome assessment (detection bias) primary outcome	Unclear risk	Not stated

Kim 2016

Methods	RCT
Participants	Country: Republic of Korea Setting: outpatient hospital Age: adults (mean age: 49.1 years) Sample size: 25 participants (12 in experimental group, 13 in control group, no dropouts published) Sex: 9 women, 16 men Inclusion criteria: hemiplegia due to stroke, stroke > 6 months. MMSE > 24, understanding the procedure and purpose of the study, volunteer participation in the study

Kim 2016 *(Continued)*

	Exclusion criteria: not stated
Interventions	2 arms 1. MT: included reaching, grasping, manipulation, towel-folding, table-wiping, sponge-squeezing, peg-board, card-turnover, and typing with the unaffected limb while watching the mirror 2. Conventional exercises: arm bicycling, peg-board exercise, skateboard-supported exercises on a tabletop, donut on base putty kneading, double curved arch, bimanual placing cone, block-stacking, graded pinch exercise, plastic-cone stacking, shoulder curved arch without mirror 1and 2: 4 weeks, 5 days a week, 30 minutes a day MT or control intervention Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and after 4 weeks of therapy 1. FM-UE 2. ARAT 3. BBT 4. FIM
Notes	Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by dice with odd and even numbers
Allocation concealment (selection bias)	Low risk	Allocation by throwing dice after inclusion in the study
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Insufficient information, no drop-outs
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessors were blinded to group allocation

Kojima 2014

Methods	Randomised cross-over trial
Participants	Country: Japan Setting: inpatient rehabilitation centre Age: adults (mean age: 69.1 years) Sample size: 13 participants (6 in group 1, 7 in group 2, no dropouts) Sex: 3 women, 10 men

Kojima 2014 *(Continued)*

	Inclusion criteria: hemiparesis caused by a single stroke, between 30 and 180 days post-stroke, MMSE > 20, palpable contraction of paretic wrist and finger extensors, detectable EMG signal (> 5 V) from those muscles Exclusion criteria: cardiac pacemaker; serious contractures or pain in the shoulder, elbow or wrist; shoulder subluxation; severe cognitive impairment or severe aphasia; inability to give informed consent; engagement in any other experimental studies
Interventions	2 arms 1 and 2: standard physiotherapy and occupational therapy 1. Immediate Electromyography-triggered neuromuscular stimulation-Mirror therapy (ETMS-MT): electrical stimulation of extensor carpi radialis and extensor digitorum communis of the target threshold at the EMG level, which corresponded to 50% to 75% of the maximum active range of motion of wrist extension, if target threshold was exceeded electrical stimulation (10 seconds of symmetrical biphasic pulses at 50 Hz, pulse width of 200s, followed by 20 seconds of rest) triggered full range of motion; MT: bimanual wrist and finger extension during 10 seconds of 'on' period, during 'off' period bimanual exercises under MT condition without electrical stimulation, task difficulty was modulated gradually with functional level 2. Delayed ETMS-MT: see 1 1 and 2: 8 weeks, 5 days a week, 2 hours a day physiotherapy and occupational therapy 1 and 2: 4 weeks, 5 days a week, two 20-minute sessions a day; group 1: additional ETMS-MT for the 1st 4 weeks, group 2: additional ETMS-MT for the second 4 weeks Date of intervention: November 2009 to May 2012
Outcomes	Outcomes were recorded at baseline and after 4 weeks and 8 weeks of therapy 1. FM-UE 2. Active ROM of wrist extension 3. BBT 4. WMFT 5. MAL
Notes	Based on published and unpublished information Funding source: not stated Declarations of trialists' interests: there are no conflicts of interest

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by permuted block randomisation
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) primary outcome	High risk	Assessor not blinded to group allocation

Kumar 2013

Methods	RCT
Participants	Country: India Setting: not stated Age: adults (mean age: 57.3 years) Sample size: 30 (15 in each group, no dropouts) Sex: 8 women, 22 men Inclusion criteria: 1st stroke (ischaemic or haemorrhagic), unilateral stroke with hemiparesis, Brunnstrom recovery stage 2 - 4, age > 25 years, ambulatory before stroke, able to understand simple verbal instructions Exclusion criteria: severe cognitive disorder, previous stroke, orthopaedic or rheumatologic problems restricting lower limbs, other diseases that interfere with ability to sit or moving lower limbs
Interventions	2 arms 1 and 2: conventional physical therapy and 1. MT: MT for the lower extremity, self-selected speed, under supervision 2. Control group: no additional therapy 1 and 2: 40 - 45 minutes/day for 10 days conventional physical therapy 1: twice daily for 15 minutes for 10 days Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline, after 5 and 10 days 1. FM-LE (0 - 34 points)
Notes	Unpublished data Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Participants were randomly allocated (authors' statement)
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) primary outcome	Unclear risk	Not stated

Kuzgun 2012

Methods	RCT
Participants	Country: Turkey Setting: not stated Age: adults (mean age: 61.4 years) Sample size: 20 participants (10 in experimental group, 10 in control group, no dropouts published) Sex: 10 women, 10 men Inclusion criteria (information based on translation): 1st stroke < 8 weeks; Brunnstrom recovery stages 1 - 4 Exclusion criteria (information based on translation): previously received treatment/rehabilitation; mAS > 3; pain in the paretic side; cognitive impairments; vision impairments/neglect
Interventions	2 arms 1 and 2: conventional rehabilitation programme 1. Additional MT: wrist extension of non-paretic upper extremity 2. No additional therapy 1 and 2: 4 weeks, 5 days a week, daily 1 - 2 hours 1: additional 15 minutes , 4 times daily MT Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and after 4 weeks of therapy: 1. BRS 2. FM-UE 3. BI 4. Goniometric measurement of wrist extension
Notes	Information based on an abstract; partly translated; not possible to contact author Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by envelope method Comment: information based on translation
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated (no dropouts) Comment: information based on translation

Kuzgun 2012 *(Continued)*

Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessors were blinded Comment: information based on translation

Lee 2012

Methods	RCT
Participants	Country: Republic of Korea Setting: inpatient rehabilitation centre Age: adults (mean age: 57.1 years) Sample size: 28 (14 in each group; 2 dropped out) Sex: 11 women, 15 men Inclusion criteria: stroke within last 6 months, able to understand and follow the instructions (MMSE > 21), Brunnstrom recovery stages upper limb 1 - 4 Exclusion criteria: orthopaedic disorders, apraxia, hemineglect, upper-limb fracture, peripheral nerve injury, participation in other studies or rehabilitation programmes, participation rate < 80%
Interventions	2 arms 1 and 2: usual rehabilitation programme 1. MT: participants were instructed to observe their unaffected upper limb in mirror box while performing movements of the unaffected limb, performed by participants themselves under supervision of a guardian 2. No additional therapy 1 and 2: 75 minutes, 5 times/week 1: 1st 4 weeks, 5 days/week, 25 minutes twice a day MT Date of intervention: not stated
Outcomes	Outcomes were recorded and reported at baseline and after 1 day after therapy period 1. FM-UE (0 - 66 points) 2. Brunnstrom recovery stages 3. MFT (0 - 32 points)
Notes	Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by computer-generated random sequence
Allocation concealment (selection bias)	Unclear risk	Not stated

Lee 2012 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	High risk	Dropouts were not analysed
Blinding of outcome assessment (detection bias) primary outcome	Unclear risk	Not stated

Lee 2016

Methods	RCT
Participants	Country: Republic of Korea Setting: rehabilitation hospital Age: adults (mean age: 54.7 years) Sample size: 30 participants (15 in experimental group (1 dropped out), 15 in control group (2 dropped out)) Sex: 13 women, 14 men Inclusion criteria: stroke diagnosed by a neurologist using computed tomography or magnetic resonance imaging, hemiplegia for > 6 months after stroke onset, active ankle dorsiflexion ROM > 10 °, ability to walk > 10 metres independently, MMSE > 21, no visual problems, no adverse effects from NMES, absence of use of any medication that could affect balance or gait Exclusion criteria: uncontrolled blood pressure or angina, history of seizure, pacemaker use, musculoskeletal problems of the lower extremity, any intervention other than conventional therapy
Interventions	2 arms 1 and 2: conventional physiotherapy 1. MT + NMES: NMES electrodes placed on common peroneal nerve to stimulate eversion and dorsiflexion of the affected ankle, an external switch placed on forefoot of less affected side, if switch was released electrical stimulation started, participants dorsiflexed both ankles independently while observing the mirror 2. No additional therapy 1 and 2: 4 weeks, 5 days a week, 1 hour a day 1: additional 4 weeks, 5 days a week MT Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and 1 day after therapy period 1. Muscle strength of the lower extremity (handheld dynamometer) 2. Modified AS 3. BBS 4. TUG 5. 6-metre walk test
Notes	Funding source: not stated Declarations of trialists' interests: not stated

Lee 2016 *(Continued)*

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by random number tables
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	High risk	No ITT analysis
Blinding of outcome assessment (detection bias) primary outcome	Low risk	2 assessors were blinded to group allocation

Lim 2016

Methods	RCT
Participants	Country: Republic of Korea Setting: inpatient rehablitation centre Age: adults (mean age: 64.9 years) Sample size: 60 (30 in each group, no dropouts) Sex: 21 women, 39 men Inclusion criteria: hemiplegia due to stroke within 6 months, Korean version of MMSE > 24, BRS upper extremity of 3 to 4 Exclusion criteria: musculoskeletal disease, neglect, mental illness
Interventions	2 arms 1. MT: bilateral task-oriented MT, during 1st week simple movements, such as forearm pronation-supination and wrist flexion/extension; in the 2nd week finger flexion-extension, counting numbers, tapping, and opposing; during 3rd week, simple manipulating tasks, such as picking up coins and beans, flipping over cards and collecting blocks in a bin; during 4th week, more complicated tasks of plugging and unplugging pegboards, drawing simple figures, and colouring 2. Sham therapy: task-oriented bilateral arm training as stated, but with non-reflecting board between limbs 1 and 2: 4 weeks, 5 days a week, 20 minutes/day MT or sham therapy Date of intervention: February to May 2012
Outcomes	Outcomes were recorded at baseline and after therapy period 1. FMA-UE 2. BRS 3. MBI
Notes	Funding source: not stated

Lim 2016 *(Continued)*

	Declarations of trialists' interests: there are no conflicts of interest

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by computer-generated random-number sequence
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated (no dropouts)
Blinding of outcome assessment (detection bias) primary outcome	Unclear risk	Not stated

Lin 2014a

Methods	RCT
Participants	Country: Taiwan Setting: inpatient and outpatient Age: adults (mean age: 55 years) Sample size: 43 participants (14 in experimental group 1, 14 in experimental group 2, 15 in control group, 1 dropout) Sex: 11 women, 32 men Inclusion criteria: ischaemic or haemorrhagic stroke of at least 6 months duration, Brunnstrom stage 3 or above in the arm Exclusion criteria: severe spasticity in any joints of the affected arm (modified AS ≤ 2), serious cognitive deficits (MMSE score > 24), serious vision or visual perception deficits (score of 0 on the best gaze and visual subtest of the National Institutes of Health Stroke Scale), history of other neurologic, neuromuscular, or orthopaedic disease, participation in other studies concurrent with this study
Interventions	3 arms 1. MT while using a mesh-glove for sensory stimulation 2. MT: 10 minutes warm-up, 1 hour mirror-box training (bilateral movement (transitive and intransitive gross motor tasks)), 20 minutes functional task practice 3. Task-oriented treatment 1, 2, and 3: 4 weeks, 5 days a week, 1½ hours daily Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and after therapy 1. FM-UE 2. myotonometric measurements for muscle tone

Lin 2014a *(Continued)*

	3. BBT 4. 10-minute walk test 5. MAL 6. ABILHAND 7. motor control using video-based analysis 8. VAS of adverse effects (pain, fatigue)
Notes	Funding source: National Health Research Institutes, National Science Council, Healthy Ageing Research Center at Chang Gung University, Taiwan Declarations of trialists' interests: there are no conflicts of interest

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned , stratified into 4 strata according to the side of lesion and the level of motor impairment
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	High risk	Dropouts not analysed
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessors were blinded to group allocation

Manton 2002

Methods	RCT
Participants	Country: USA Setting: home Age: adults (age not stated) Sample size: 10 participants Sex: not stated Inclusion criteria: 6 months or more post-cerebrovascular accident Exclusion criteria: not stated
Interventions	2 arms 1. MT: home exercise programme with a mirror exercise unit 2. Control group: same programme with a plexiglass exercise unit 1 and 2: 4 weeks Date of intervention: not stated
Outcomes	Outcomes were recorded at pretreatment, mid-treatment, post-treatment and after 3 months

Manton 2002 *(Continued)*

	1. WMFT
Notes	Abstract data only; not included in the analysis due to insufficient data Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Ability-matched pairs were created and randomly assigned to groups
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) primary outcome	Unclear risk	Not stated

Marquez 2012

Methods	RCT
Participants	Country: Australia Setting: inpatient rehabilitation unit Age: adults (mean age: 68.7 years) Sample size: 15 participants (5 in experimental group, 10 in 2 control groups, no dropouts) Sex: 8 women, 7 men Inclusion criteria: first-ever neurological injury < 8 weeks, affected dorsiflexion strength of < Grade 3, ambulatory prior to admission Exclusion criteria: impaired cognition (MoCA < 21), peripheral neuropathy, impaired ROM of the intact lower limb, medically unfit for rehabilitation
Interventions	3 arms 1, 2 and 3: individual physiotherapy sessions 1. MT: alternate ankle dorsiflexion and plantarflexion of both ankles as best they could while looking into the mirror 2. Sham therapy: same as MT but with non-reflecting side of the mirror 1, 2 and 3: 3 weeks, 5 days a week, 45 minutes a day individual physiotherapy 1 and 2: 15 minutes MT or sham therapy during the individual physiotherapy session Date of intervention: not stated

Marquez 2012 *(Continued)*

Outcomes	Outcomes were recorded at baseline, after 3 weeks of therapy, and 6 weeks after the intervention 1. Muscle strength 2. MAS Item 5 (Mobility) 3. Dynamic balance 4. Spasticity 5. Sensation 6. Oedema
Notes	Based on unpublished information, only stroke patients included Funding source: National Stroke Foundation, Australia Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by computer-generated random numbers
Allocation concealment (selection bias)	Low risk	Concealed allocation by independent person
Incomplete outcome data (attrition bias) All outcomes	Low risk	All data collected, reported and analysed as allocated
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessors were blinded to group allocation

Michielsen 2011

Methods	RCT
Participants	Country: Netherlands Setting: home Age: adults (mean age: 57 years) Sample size: 40 participants (20 in each group,; 4 dropped out during intervention period, 4 more dropped out after 6 months) Sex: 20 women, 20 men Inclusion criteria: knowledge of Dutch language, Brunnstrom score upper extremity between 3 and 5; home dwelling status; at least 1 year post-stroke Exclusion criteria: neglect; comorbidities that influenced upper extremity usage; history of multiple strokes
Interventions	2 arms 1. MT: participants were instructed to move both arms while looking in the mirror (moving arm covered)

Michielsen 2011 *(Continued)*

	2. Bilateral arm training: participants performed the same treatment protocol as in group 1, but without a mirror 1 and 2: once a week physiotherapeutic supervision for 60 minutes; 5 times a week, 60 minutes of practice at home for 6 weeks Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline, post-treatment and after 6 months 1. FM-UE motor score (0 to 66) 2. Pain (VAS 0 to 100 mm) 3. Grip force (in kg) 4. TS elbow and wrist 5. ARAT (0 to 57) 6. ABILHAND questionnaire (self-perceived arm use) 7. Stroke-ULAM; accelerometric measurement of arm movements during 24 hours 8. EuroQol (quality of life, EQ-5D)
Notes	Published and unpublished data Funding source: Fonds NutsOhra [SNO-T-0602-23]; Innovatiefonds Zorgverzekeraars [06-262]; Wetenschappelijk College Fysiotherapie [WU/2007/07] and Hersenstichting Nederland [15F07.54] Declarations of trialists' interests: there are no conflicts of interest

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated random-number sequence
Allocation concealment (selection bias)	Low risk	Participants received group allocation after baseline measurement
Incomplete outcome data (attrition bias) All outcomes	Low risk	Results were analysed on an ITT basis (multiple imputation)
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessors were blinded to group allocation

Mirela 2015

Methods	RCT
Participants	Country: Romania Setting: inpatient Age: adults (mean age: 57.5 years) Sample size: 15 participants (7 in experimental group, 8 in control group, no dropouts published) Sex: 8 women, 7 men

Mirela 2015 *(Continued)*

	Inclusion criteria: hemiplegia following a 1st stroke (documented by CT scan), time from stroke between 1 to 3 months, without severe attention deficit Exclusion criteria: global aphasia and cognitive impairments that might interfere with understanding instructions for testing, concomitant progressive central or peripheral nervous system disorders
Interventions	2 arms 1 and 2: conventional stroke rehabilitation programme (neuro-rehabilitation technique, electrical stimulation and occupational therapy) 1. MT: bilateral (as good as possible) upper limb movements (flexion and extension of the shoulder, elbow, wrist and finger, pronation and supination of the forearm) under physiotherapeutic supervision 2. No additional therapy 1 and 2: 6 weeks, 5 times a week, 30 minutes a session conventional stroke rehabilitation programme 1: additional 30 minutes of MT Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and 1 day after therapy 1. BRS 2. FM-UE 3. AS 4. Bhakta test for assessment of finger flexion degree
Notes	Funding source: not financed Declarations of trialists' interests: there are no conflicts of interest

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Participants were randomly assigned (authors' statement)
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) primary outcome	Unclear risk	Not stated

Mohan 2013

Methods	RCT
Participants	Country: India Setting: inpatient rehabilitation centre

Mohan 2013 *(Continued)*

	Age: adults (mean age: 63 years) Sample size: 22 participants (11 in each group, no dropouts published) Sex: 10 women, 12 men Inclusion criteria: 1st episode of unilateral stroke with hemiparesis (onset ≤ 2 weeks), able to understand and follow simple verbal instructions, Brunnstrom recovery stage 2 and above, no severe cognitive disorders that would interfere with the study's purpose (MMSE score > 23), stable medical condition to allow participation in the study, ambulatory before stroke Exclusion criteria: neglect, Pusher syndrome, visual deficits, and history of multiple stroke, or comorbidities that influenced lower extremity usage
Interventions	2 arms 1 and 2: conventional stroke rehabilitation programme: neurodevelopmental facilitation techniques, sensory motor re-education, active exercises, mobility training, balance, and gait training 1. Additional MT: unaffected lower limb movements (hip-knee-ankle flexion, with the hip and knee placed in flexion, moving the knee inward and outward, hip abduction with external rotation followed by hip adduction with internal rotation, hip-knee-ankle flexion, knee extension with ankle dorsiflexion, knee flexion beyond 90 ° (each exercise was performed in 2 sets of 10 repetitions) 2. Additional sham therapy: using non-reflecting surface of the mirror 1 and 2: 2 weeks, 6 days a week, 60 minutes a day and additional 30 minutes of MT or sham therapy Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and after 2 weeks of therapy 1. FM-LE (0 - 34) 2. Brunnel Balance Assessment 3. FAC (0 - 5) 4. BRS-LE 5. MCSI (0 - 4) 6. adverse events
Notes	Funding source: not financed (according to authors) Declarations of trialists' interests: there are no conflicts of interest (according to authors)

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned (authors' statement) by block randomisation
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants analysed as intended
Blinding of outcome assessment (detection bias) primary outcome	Unclear risk	Not stated

Moustapha 2012

Methods	Randomised cross-over trial
Participants	Country: France Setting: not stated Age: adults (mean age: 53.5 years) Sample size: 8 participants (4 in each group, 2 dropouts) Sex: 4 women, 4 men Inclusion criteria: neglect (according to Negligence Evaluation Battery) secondary to a unilateral stroke of the right hemisphere Exclusion criteria: other concomitant cerebral injuries, Illetrism or cognitive dysfunction altering comprehension
Interventions	2 arms 1. MT: sequence of analytical movements with right upper limb while looking to the image in the mirror 2. Sham therapy: the image of the right arm was replaced by landscape images, participants were asked to describe the images in the mirror, no movement 1 and 2: 5 days a week, 30 minutes a day; 1: MT for 5 consecutive days, 1 session a day, after 10 days sham therapy for 5 consecutive days; 2: same protocol as group 1, but participants received sham therapy before MT Date of intervention: not stated
Outcomes	Outcomes were recorded before and after each session 1. LBT 2. Cancellation task (Mesulam Test)
Notes	Based on unpublished information Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by randomised-number sequence
Allocation concealment (selection bias)	Low risk	Concealed allocation by drawing lots
Incomplete outcome data (attrition bias) All outcomes	High risk	No ITT analysis was performed
Blinding of outcome assessment (detection bias)	Low risk	Assessor was blinded to group allocation

Moustapha 2012 *(Continued)*

primary outcome

Nagapattinam 2015

Methods	RCT
Participants	Country: India Seting: hospital Age: adults (mean age: 44.9 years) Sample size: 60 participants (40 in 2 experimental groups, 20 in control group, 1 dropout) Sex: 20 women, 40 men Inclusion criteria: unilateral hemiplegic stroke, between 6 weeks and 6 months post-stroke, ischaemic stroke, age 18 to 60 years, both men and women, BRS 2 - 5, modified AS ≥ 1, voluntary extension of wrist and fingers of at least 10 ° from the resting position Exclusion criteria: > 60 years of age, BRS 1 or 6, wrist and/or finger contracture, cardiac pacemaker or other metal implants, significant visual, auditory and cognitive impairment
Interventions	3 arms 1, 2 and 3: conventional therapy 1. Task-oriented MT: bilateral active wrist extension and fingers extension in mid-prone and pronated forearm, task-specific grasping and releasing of a bottle while looking to the image of the unaffected hand in the mirror 2. FES: electrodes placed on wrist extensors of the affected upper limb, participants were instructed to look into the opaque side of the mirror while the stimulation was given and was asked to perform the following exercises synchronously with the duty cycle of the stimulation, parameters of stimulation: frequency 35 Hz, pulse width 250 µs, symmetrical biphasic waveform, duty cycle of 5 secs on and 5 secs off, amplitude adjusted to maximal tolerance of the participant up to 90 mA 3. Task-oriented MT plus FES: participants were instructed to observe the mirror reflection and asked to perform simultaneous bilateral movements with the affected limb performing synchronously with the duty cycle of electrical stimulation 1, 2 and 3: 2 weeks, 6 days a week, 30 minutes daily MT, MT + FES, or FES Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and after 2 weeks of therapy 1. ARAT
Notes	Based on published information Funding source: not stated Declarations of trialists' interests: none

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by cards composed of odd and even numbers

Nagapattinam 2015 *(Continued)*

Allocation concealment (selection bias)	Low risk	Concealed allocation by sealed envelopes
Incomplete outcome data (attrition bias) All outcomes	Low risk	All data were collected and analysed as allocated
Blinding of outcome assessment (detection bias) primary outcome	High risk	Assessors were not blinded to group allocation

Pandian 2014

Methods	RCT
Participants	Country: India Setting: inpatient rehabilitation centre and home training after discharge Age: adults (mean age: 63.4 years) Sample size: 48 participants (27 in experimental group, 21 in control group, 2 dropouts) Sex: 20 women, 28 men Inclusion criteria: stroke patients with thalamic and parietal lobe lesions within 48 hours of stroke onset who had upper limb weakness, provided informed consent Exclusion criteria: Glasgow Coma Scale score < 7, unco-operative patients
Interventions	2 arms 1 and 2: home programme 1. Additional MT: bilateral flexion and extension of wrist and fingers, active or assistive limb activation (tapping the affected hand or fingers on a plain surface and goal-oriented activities (combing, tying turban (for men), wearing garments, picking up objects and placing them on the table, pouring and drinking from a cup) 2. Additional sham therapy: using non-reflecting surface of the mirror and active or assistive limb activation 1: 4 weeks, 5 days a week, 1 hour a day MT and 1 hour limb activation 2: 4 weeks, 5 days a week, 1 hour a day sham therapy and 1 hour limb activation Date of intervention: January 2011 to August 2013
Outcomes	Outcomes were recorded at baseline and at 1, 3 and 6 months 1. SCT 2. LBT 3. FIM 4. mRS 5. Picture identification task (PIT)
Notes	Published and unpublished information Funding source: Christian Medical College, Department of Neurology, India, Intramural research fund

Pandian 2014 *(Continued)*

	Declarations of trialists' interests: there are no conflicts of interest to the manuscript; full disclosures at http://n.neurology.org/content/83/11/1012/tab-article-info

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by computer-generated random sequence
Allocation concealment (selection bias)	Low risk	Concealed allocation by sealed numbered envelopes
Incomplete outcome data (attrition bias) All outcomes	Low risk	ITT analysis performed ('last observation carried forward' method)
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessors were blinded to group allocation

Park 2015a

Methods	RCT
Participants	Country: Republic of Korea Setting: inpatient Age: adults (mean age: 56.3 years) Sample size: 30 participants (15 in each group) Sex: 13 women, 17 men Inclusion criteria: diagnosis of hemiplegia due to stroke of at least a 6-month duration, scores of ≥ 24 points on the MMSE-Korean (MMSE-K; no difficulty with cognitive functions), Brunnstrom's upper extremity stage IV, no difficulties with perceptual abilities including hemineglect based on the MVPT, voluntary consent to participate in the study Exclusion criteria: not stated
Interventions	2 arms 1 and 2: conventional occupational therapy 1. Additional MT: movements of the non-paretic side 2. Additional sham therapy: participants performed the same exercises as the MT group while watching the non-reflecting surface of the mirror 1 and 2: 4 weeks, 5 days a week, 30 minutes MT or sham therapy Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and after therapy 1. FM-UE 2. BBT

Park 2015a *(Continued)*

	3. FIM
Notes	Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by random card selection
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) primary outcome	Unclear risk	Not stated

Park 2015b

Methods	RCT
Participants	Country: South Korea Setting: rehabilitation unit Age: adults (mean age: 60 years) Sample size: 30 participants (15 in experimental group, 15 in control group, no dropouts published) Sex: 15 women, 15 men Inclusion criteria: stroke > 3 months identifiable by CT or MRI, no cognitive dysfunction that would interfere with the study purpose as indicated by a MMSE-K > 24, no perceptual disorder or unilateral neglect that would have interfered with the study purpose as indicated by the MVPT, Brunnstrom score between stages I – IV for the UE Exclusion criteria: aphasia, vision or hearing disorders, or had had MT previously
Interventions	2 arms 1. Task-oriented mirror therapy: unilateral, performed 8 different tasks, e.g. lift/grasp a cup, reach to grasp a cone 2. Sham therapy (covered mirror): same 8 tasks 1 and 2: 6 weeks, 5 days a week task-oriented MT or sham therapy Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and immediately after treatment and 1 month after treatment 1. MFT

Park 2015b *(Continued)*

	2. FIM
Notes	Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Participants were randomly assigned
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) primary outcome	Unclear risk	Not stated

Piravej 2012

Methods	RCT
Participants	Country: Thailand Setting: inpatient rehabilitation centre Age: adults (mean age: 56 years) Sample Size: 47 participants (20 in each group; 7 dropped out) Sex: 19 women, 21 men Inclusion criteria: 1st stroke hemiparesis onset more than 3 months, age > 18 years, able to follow 2-step command, upper extremity Brunnstrom stage between 1 and 4, able to sit with or without support more than 30 minutes, cognitive function evaluated by MMSE ≥ 24, no previous disease of the hemiparetic side Exclusion criteria: unstable medical conditions, sensory or global aphasia, severe spasticity (mAS > 3), neglect of the hemiparetic side
Interventions	2 arms 1. MT: MT with task-oriented activity consisted of grasping and releasing the tennis balls, pins and cylindrical shape 2. Sham therapy: same tasks without mirror (use the other side of the mirror box) 1 and 2: 30 minutes/session, 10 sessions Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and at the end of 2 weeks, 4 weeks and 12 weeks 1. Brunnstorm stage of recovery 2. MAS upper extremity

Piravej 2012 *(Continued)*

	3. Modified AS 4. Tip and lateral pinch gauges
Notes	Published and unpublished data Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by blocked randomisation, computer-generated random sequence
Allocation concealment (selection bias)	Low risk	Central randomisation by a third party
Incomplete outcome data (attrition bias) All outcomes	High risk	Dropouts not analysed
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessors were blinded to group allocation

Rajappan 2016

Methods	RCT
Participants	Country: Malaysia Setting: nursing homes Age: adults (mean age: 58 years) Sample size: 30 participants (15 in each group: 1 dropped out from the experimental group) Sex: 9 women, 21 men Inclusion criteria: men and women, age 50 to 70 years, 1st episode of unilateral stroke with hemiparesis, 2 to 12 months post-stroke, diagnosis of stroke with involvement of middle cerebral artery on MRI or CT scan by neurologist Exclusion criteria: MMSE < 24, uncontrolled systemic hypertension, perceptual or apraxic deficits, visual deficit such as homonymous hemianopia, reflex sympathetic dystrophy, severe shoulder subluxation, contracture in the affected upper limb and botox injection within past 6 months to the affected upper limb
Interventions	2 arms 1 and 2: conventional rehabilitation programme 1. MT: bilateral finger flexion, extension, abduction, adduction; wrist flexion, extension, ulnar deviation and radial deviation; task-specific movements such as power and prehension grip using different size and weighted objects while looking into the mirror 2. Sham therapy: same tasks as MT but using the non-reflecting side of the mirror

Rajappan 2016 *(Continued)*

	1 and 2: 4 weeks, 5 days a week, 1 hour a day conventional rehabilitation programme 1 and 2: additional 30 minutes a day MT or sham therapy Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and after 4 weeks of therapy 1. FM-UE 2. UEFI
Notes	Information based on unpublished data Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned (authors' statement)
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	High risk	Dropouts were not included in the analysis
Blinding of outcome assessment (detection bias) primary outcome	Unclear risk	Not stated

Rehani 2015

Methods	RCT
Participants	Country: India Setting: outpatient Age: adults (mean age: 54.8/57.9 years) Sample size: 20 participants (6 in experimental group, 6 in control group, 8 dropped out) Sex: not stated Inclusion criteria: age 45 to 65 years, 1st episode of ischaemic and haemorrhagic stroke, stroke between 1 to 6 months, men and women, MMSE > 23, BRS 4 and 5 Exclusion criteria: any musculoskeletal disorders, neurological disorder other than stroke, visual impairment, systemic disease, non-cooperative patients, psychological problems
Interventions	2 arms 1 and 2: conventional therapy

Rehani 2015 *(Continued)*

	1. MT: bilateral intransitive exercises such as hand opening, wrist extension and flexion, forearm pronation and supination, hand sliding on a flat surface while looking into the mirror 2. MRP: Motor relearning programme exercises for training of wrist extensors, extension of wrist and holding objects, training of supination of forearm, opposition of thumb, cupping of hand and training of manipulation of the objects 1 and 2: 4 weeks, 6 days a week, 30 minutes a day conventional therapy 1 and 2: additional 30 minutes a day MT or MRP Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and after 4 weeks of therapy 1. CAHAI
Notes	Information based on unpublished data Funding source: not stated Declarations of trialists' interests: none

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by computer-generated random-number sequence
Allocation concealment (selection bias)	Low risk	Concealed allocation by an independent investigator
Incomplete outcome data (attrition bias) All outcomes	High risk	Dropouts were not included in analysis
Blinding of outcome assessment (detection bias) primary outcome	Unclear risk	Not stated

Rodrigues 2016

Methods	RCT
Participants	Country: Brazil Setting: home Age: adults (mean age: 57.5 years) Sample size: 16 participants (8 in each group: no dropouts published) Sex: 6 women, 10 men Inclusion criteria: stroke > 6 months, spasticity < 3 modified AS for horizontal shoulder adductors, elbow flexors, and wrist and finger flexors; FM-UE score 30 - 49 points Exclusion criteria: other neurological diseases, orthopaedic upper limb problems which interfered with their activity level, uncontrolled shoulder pain, significant uncorrectable visual impairment, aphasia or

Rodrigues 2016 *(Continued)*

	difficulty understanding simple tasks, visual hemineglect, those who were receiving other upper-limb interventions
Interventions	2 arms 1. MT: object-related bilateral symmetric upper limb training while looking into the mirror 2. Sham-therapy: object-related bilateral symmetric upper-limb training using covered mirror 1 and 2: 4 weeks, 3 days a week, 1 hour a day MT or sham therapy Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline, after 4 weeks of therapy, and 2 weeks after training 1. TEMPA (Brazilian version) 2. FM-UE
Notes	Funding source: not stated Declarations of trialists' interests: there are no conflicts of interest

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by computer-generated random-number sequence
Allocation concealment (selection bias)	Low risk	Allocation by independent person and stapled, sealed envelopes
Incomplete outcome data (attrition bias) All outcomes	Low risk	ITT was performed (authors' information)
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Outcome measures were videotaped and rated by a trained physiotherapist blinded to the group allocation

Rothgangel 2004

Methods	RCT; 2 baseline subgroups
Participants	Country: Netherlands Setting: inpatient and outpatient rehabilitation centre Age: adults (mean age: 73.4 years) Sample size: 16 participants (6 in the outpatient centre group (Rothgangel 2004a), 10 in the inpatient rehabilitation group (Rothgangel 2004b) Sex: 10 women, 6 men Inclusion criteria: 1st stroke in the territory of the middle cerebral artery; minimum 3 months post-stroke; minimum score of 1 in the ARAT Exclusion criteria: bilateral stroke; severe neglect; severe visual impairments

Rothgangel 2004 *(Continued)*

Interventions	2 arms 1. MT: participants were instructed to move either both arms (muscle hypotonia), or just the unaffected arm (muscle hypertonia); therapist was moving the affected arm; gross, functional and fine-motor movements were trained 2. Bilateral arm training: same treatment protocol as in group 1, but without a mirror 1 and 2: day hospital group (6 participants): 17 treatments during 5 weeks for 30 minutes each; inpatient rehabilitation group (10 participants): 37 treatments during 5 weeks for 30 minutes each Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline, in the middle of the treatment, after 5 weeks of treatment and 10 weeks after baseline 1. ARAT (0 to 57) 2. Participant-specific problem scale (0 to 100) 3. Adverse events
Notes	Due to sufficient differences in treatment intensity, we analysed both experimental and both control groups separately Significant differences in baseline characteristics (age, ARAT, participant-specific problem scale) Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated random-number sequence
Allocation concealment (selection bias)	Low risk	Participants received group allocation after baseline measurement
Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants were analysed as allocated to groups. No dropouts
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessors were blinded to group allocation

Rothgangel 2004a

Methods	RCT; subgroup: outpatient centre
Participants	see Rothgangel 2004
Interventions	see Rothgangel 2004
Outcomes	see Rothgangel 2004

Rothgangel 2004a *(Continued)*

Notes	see Rothgangel 2004

Rothgangel 2004b

Methods	RCT; subgroup: inpatient rehabilitation
Participants	see Rothgangel 2004
Interventions	see Rothgangel 2004
Outcomes	see Rothgangel 2004
Notes	see Rothgangel 2004

Salhab 2016

Methods	Randomised cross-over trial
Participants	Country: Lebanon/USA Setting: not stated Age: adults (age not stated) Sample size: 18 participants (9 in experimental group, 9 in control group, no dropouts published) Sex: not stated Inclusion criteria: stroke (subacute stage) Exclusion criteria: not stated
Interventions	2 arms 1. MT + electrical stimulation 2. Conventional therapy 1 and 2: 2 weeks, 4 times a week, 50 minutes MT + ES or conventional therapy; followed by 2 weeks vice versa Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline, after 1st 2 weeks, and immediately after the last 2 weeks, and 4 weeks after end of training 1. ROM: ankle dorsi-flexion 2. lower extremity sensory-motor function 3. walking duration
Notes	Information based on abstract Funding source: not stated Declarations of trialists' interests: not stated

Salhab 2016 *(Continued)*

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Participants were randomly assigned
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) primary outcome	Unclear risk	Not stated

Samuelkamaleshkumar 2014

Methods	RCT
Participants	Country: India Seting: inpatient rehabilitation centre Age: adults (mean age: 51.2 years) Sample size: 20 participants (10 in each group, no dropouts published) Sex: 4 women, 16 men Inclusion criteria: aged between 18 and 60 years, first-time ischaemic or haemorrhagic stroke of the middle cerebral artery tertiary, occurring < 6 months before the start of the study, Brunnstrom recovery stages I to IV for the arm and hand, MMSE > 24 Exclusion criteria: not stated
Interventions	2 arms 1 and 2: conventional stroke rehabilitation 1: additional MT: participants performed unilateral movements while watching in the mirror 2: additional sham therapy: participants performed the same exercises as in MT group using the non-reflecting surface of the mirror 1 and 2: 3 weeks, 5 days a week, 6 hours conventional stroke rehabilitation 1 and 2: 3 weeks, 5 days a week, 2 x 30 minutes additional MT or sham therapy a day Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and after therapy 1. FM-UE (0 - 66) 2. BRS 3. BBT 4. mAS

Samuelkamaleshkumar 2014 *(Continued)*

	5. Adverse events
Notes	Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by computer-generated random number sequence
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessor was blinded to group allocation

Schick 2017

Methods	RCT
Participants	Country: Austria/Germany Setting: 3 inpatient rehabilitation centres Age: adults (mean age: 63 years) Sample size: 32 participants (15 in experimental group, 17 in control group, 2 dropouts) Sex: 13 women, 19 men Inclusion criteria: had suffered their 1st ischaemic or haemorrhagic stroke within 6 months prior to entering the study, had severe (FM-UE ≥ 18 ≤ 33 points) or very severe arm paresis (FM-UE ≤ 17 points) as assessed with the Fugl-Meyer Assessment, had arm/hand function that could be electrically stimulated and EMG-triggered pulses that could be elicited, reported to have been independent in their activities of daily living before stroke, reported to have had full functionality of their upper extremities before the stroke, and were able to understand study tasks and test instructions Exclusion criteria: were pregnant, had an implanted cardiac pacemaker, defibrillator, brain stimulation, drug pump, or metal implant, had wounds, thrombosis, or phlebitis in the stimulation area; severe forms of Dupuytren's contracture, dementia and concomitant severe neurological diseases; or profound neurocognitive deficits
Interventions	2 arms 1 and 2: conventional therapy 1. Multi-channel EMG-triggered electrostimulation (EMG-MES) + MT: electrostimulation with a device (4 muscle stimulation channels and up to2 EMG measurement channels), EMG-triggered pulses for the affected and the unaffected sides were measured and elicited exclusively via the unimpaired side to initiate synchronous bilateral forearm and hand movements (grip and release without objects), standard current frequency was between 30 and 35 Hz, participants were asked to observe the grasping

Schick 2017 *(Continued)*

	movements of their unaffected limb in the mirror and actively imagine that they were movements of their affected limb 2. EMG-MES: same device and protocol (same pulse intensity, same standard current frequency) participants observed directly their grip and release movements on the affected side 1 and 2: 3 weeks, 5 days a week conventional therapy 1 and 2: 3 weeks, 5 days a week, 30 minutes a day EMG-MES + MT or EMG-MES Date of intervention: September 2013 to August 2014
Outcomes	Outcomes were recorded at baseline and after therapy 1. FM-UE (0 - 66 points) 2. German language version of the Rivermead Assessment of Somatosensory Performance (RASP-DT) 3. BBT 4. GAS 5. BI
Notes	Abstract published in 2015, full-text publication received in 2017 Funding source: not stated Declarations of trialists' interests: the first author was employed by MED-EL after the end of study (STILLWELL, one of the distributors and developers of the stimulation device which was used in the study) and gives seminars for EMG-triggered multichannel electrostimulation; the senior author delivers seminars and has authored two manuals on MT; the other authors declared no potential conflicts of interest

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by computer-generated random-number sequence and block randomisation
Allocation concealment (selection bias)	Low risk	Concealed allocation by sealed envelopes and independent investigator
Incomplete outcome data (attrition bias) All outcomes	Low risk	All data included as intended
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessor were blinded to group allocation

Seok 2010

Methods	RCT
Participants	Country: South Korea Setting: inpatient rehabilitation centre Age: adults (mean age: 51.4 years) Sample size: 40 participants (19 in mirror therapy group, 21 in control group)

Seok 2010 *(Continued)*

	Sex: 22 women, 18 men Inclusion criteria: stroke within 6 months Exclusion criteria: not able to understand treatment instructions; communication difficulties due to aphasia; MMSE < 15 points; musculoskeletal or neurological damage of the unaffected upper extremity; modified AS of 3 or more points; Brunnstrom stage of recovery (arm) of 1 or more than 5 points
Interventions	2 arms 1. MT 2. No additional therapy 1 and 2: 5 days a week, 30 minutes of therapy for 4 weeks Date of intervention: September 2008 to February 2009
Outcomes	Outcomes were recorded at baseline and after 4 weeks of treatment 1. MFT 2. MMT 3. Grip strength
Notes	Published data only, extracted in part on the basis of an unauthorised, automatic translation of the original publication in Korean; Significant difference in MFT between groups at baseline measurement Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated random-number sequence
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessors were blinded to group allocation

Sütbeyaz 2007

Methods	RCT
Participants	Country: Turkey Setting: inpatient rehabilitation centre Age: adults (mean age: 63.4 years)

Sütbeyaz 2007 *(Continued)*

	Sample size: 40 participants (20 in each group; 7 dropped out at 6 months follow-up) Sex: 17 women, 23 men Inclusion criteria: 1st unilateral stroke during previous 12 months; a score of 1 or 2 in the Brunnstrom stages of lower extremity; ambulatory before stroke Exclusion criteria: severe cognitive disorders
Interventions	2 arms 1. MT: participants were instructed to move the non-paretic leg while looking in the mirror 2. Sham therapy: participants performed the same treatment protocol as in group 1 but with the non-reflecting side of the mirror to the non-affected leg 1 and 2: 5 days a week, 30 minutes of therapy for 4 weeks Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline, after 4 weeks and after 6 months 1. Brunnstrom stages lower extremity (0 to 6) 2. FIM motor items (13 to 91) 3. MAS (0 to 4)) 4. FAC (0 to 5)
Notes	Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Block randomisation, computer-generated allocation of blocks
Allocation concealment (selection bias)	Low risk	The physicians who assessed potential participants to determine eligibility did not know to which group the participants would be allocated
Incomplete outcome data (attrition bias) All outcomes	High risk	Dropouts were not included in analysis
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessors were blinded to group allocation

Tezuka 2006

Methods	Randomised cross-over trial
Participants	Country: Japan Setting: inpatient rehabilitation centre Age: adults (mean age: 63.7 years)

Tezuka 2006 *(Continued)*

	Sample size: 15 participants (9 in mirror therapy group; 6 dropped out, 4 during the 1st interval) Sex: 9 women, 6 men Inclusion criteria: people admitted or planned to be admitted to rehabilitation ward on the hospital due to post-stroke hemiparesis; within 1 month post-stroke; informed consent was obtained from the participant and their family Exclusion criteria: higher brain dysfunction
Interventions	2 arms 1. MT: participants were instructed to move the non-paretic arm while looking in the mirror and passive movement of the paretic arm provided by therapist 2. Passive arm movements: using only passive movements of the affected arm without a mirror 1 and 2: 10 to 15 minutes a day for 4 weeks, followed by 4 weeks vice versa Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline and after 4 weeks of therapy 1. FM wrist and fingers motor score (0 to 24)
Notes	We only analysed the 1st intervention period of 4 weeks Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated allocation to groups
Allocation concealment (selection bias)	High risk	Stated by authors (unpublished information)
Incomplete outcome data (attrition bias) All outcomes	High risk	Stated by authors (unpublished information)
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessors were blinded to group allocation

Thieme 2013

Methods	RCT
Participants	Country: Germany Setting: inpatient rehabilitation centre Age: adults (mean age: 67.2 years)

Thieme 2013 *(Continued)*

	Sample size: 60 participants (21 in the mirror therapy group intervention, 18 in the mirror therapy single therapy, 21 in the sham group; 11 dropped out in the intervention period) Sex: 25 women, 35 men Inclusion criteria: 1st supratentorial stroke within the previous 3 months; aged between 18 and 80 years; clinically diagnosed severe hemiparesis or hemiplegia of the distal upper limb with MRC grading of 0 or 1 of wrist and finger extensors Exclusion criteria: visual impairments that may limit participation in mirror therapy; severe cognitive and/or language deficits which preclude participants from following instructions in the group training protocol; other neurological or musculoskeletal impairments of the upper extremity not due to stroke; severe neglect (head is not turned to the affected side due to instruction)
Interventions	3 arms 1, 2 and 3: standard rehabilitation programme, additional: 1. MT group intervention: participants perform movements with both arms (the affected arm as best as could be) while watching the mirror image of the unaffected arm, participants exercised in open groups of 2 to 6 participants 2. MT single therapy: see group 1, participants exercised in one-to-one therapy 3. Sham therapy: group intervention; participants exercise in open groups of 2 to 6 participants with the non-reflecting side of the mirror positioned to the unaffected arm 1, 2 and 3: 5 weeks, additional 20 sessions, 30 minutes MT, MT group or sham therapy Date of intervention: April 2009 to July 2011
Outcomes	Outcomes assessed before and after treatment, and 7 months after treatment 1. FMA-UE (0 to 66) 2. FMA sensory assessment, range of motion and pain arm 3. ARAT (0 to 57) 4. MAS (0 to 5) wrist and finger flexors, elbow flexors 5. BI (0 to 100) 6. SIS 7. SCT
Notes	Published and unpublished data Funding source: Klinik Bavaria Kreischa, Germany Declarations of trialists' interests: the first author received and will receive honorarium for presentations and seminars on MT; the other authors declared no potential conflicts of interest

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by computer-generated random sequence
Allocation concealment (selection bias)	Low risk	Concealed allocation by an independent person
Incomplete outcome data (attrition bias) All outcomes	Low risk	ITT analysis was performed ('last observation carried forward' method)

Thieme 2013 *(Continued)*

Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessors of primary outcome (motor function) were blinded to group allocation

Tyson 2015

Methods	RCT
Participants	Country: UK Setting: 12 inpatient stroke services Age: adults (mean age: 64 years) Sample size: 94 participants from 12 sites: 63 in experimental group (6 dropped out), 31 in control group (3 dropped out) Sex: 34 women, 60 men Inclusion criteria: stroke at least 1 week previously and inpatient in a stroke rehabilitation unit, no premorbid conditions limiting upper or lower limb function, sufficient cognitive and communication to give consent, medically stable and able to participate in rehabilitation, upper or lower limb weakness which limits activity Exclusion criteria: not stated
Interventions	2 arms 1 and 2: conventional rehabilitation programme 1. Participant–led MT: participants were taught how to do the mirror therapy and given an (aphasia-friendly) instruction booklet to show them how to position the mirror themselves and also the exercises to do. An allocated member of staff checked on them daily to remind them to do the therapy and complete their diary sheets, help them get set up (if necessary), deal with any problems and progress the exercises 2. Attentional control: lower limb exercises (without a mirror) 1 and 2: 4 weeks, 7 days a week, 30 minutes a day MT or lower-limb exercises Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline, after 4 weeks of therapy, and 8 weeks after baseline 1. Feasibility and acceptability of patient-led mirror therapy from a patient and staff perspective (assessed by questionnaire and interviews/ focus groups) 2. Recruitment and retention rate 3. Adherence to the therapy 4. Adverse events 5. SCT 6. MI-UL 7. BBT 8. ARAT 9. RASP 10.MAS elbow 11.Adverse events - participant self-report 12.Adherence – practice log sheets completed by the participant and treating clinician

Tyson 2015 *(Continued)*

Notes	Published and unpublished data, full-text publication received in 2016 Funding source: National Institute for Health Research under its Research for Patient Benefit (RfPB) Programme Declarations of trialists' interests: there are no conflicts of interest

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by computer-generated random-number sequence
Allocation concealment (selection bias)	Low risk	Allocation by an independent web-based randomisation service
Incomplete outcome data (attrition bias) All outcomes	High risk	No ITT analysis
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessor was blinded to group allocation

Wang 2015

Methods	RCT
Participants	Country: China Setting: not stated Age: adults (mean age: 64.9 years) Sample size: 90 participants (30 in experimental group, 60 in 2 control groups, no dropouts) Sex: 40 women, 50 men Inclusion criteria: 1st ischaemic or haemorrhagic stroke (CT or MRI); neurological deficit; aged 30 to 75 years; unilateral paralysis of upper limb; stable vital signs; mental health; normal intelligence; no significant cognitive dysfunction; MMSE > 24; middle school education and above; no visual impairment; no aphasia and dementia; can execute instructions Exclusion criteria: unstable condition; severe disease or infection of heart; liver or kidney; other complicated diseases which could affect motor function
Interventions	3 arms 1, 2 and 3: routine rehabilitation and task-oriented training 1. Additional MT upper extremity 2. Additional EMGBF 3. No additional therapy 1, 2 and 3: 8 weeks, 6 days a week, 60 minute routine rehabilitation 1: 8 weeks, 6 days a week, 30 minutes additional mirror therapy

Wang 2015 *(Continued)*

	2: 8 weeks, 6 days a week, 20 minutes additional EMGBF Date of intervention: March 2012 to June 2014
Outcomes	Outcomes were recorded at baseline and after therapy 1. FMA-UE (0 - 66) 2. UEFT 3. iEMG of affected upper extremities
Notes	Information based on abstract; extracted in part on the basis of an unauthorised, automatic translation of the original publication in Chinese Funding source: Changsha Economics Office Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Participants were randomly assigned (authors' statement)
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) primary outcome	Unclear risk	Not stated

Wu 2013

Methods	Multicentre RCT; stratified by lesion side and motor impairment level
Participants	Country: Taiwan Setting: 4 hospitals Age: adults (mean age: 54.2 years) Sample size: 33 (16 in the MT group, 17 in the control group; 12 lost to 6 months follow-up) Sex: 10 women, 23 men Inclusion criteria: 1st unilateral ischaemic or haemorrhagic cerebrovascular accident before > 6 months, mild to moderate motor impairment (FM-UE 26-56), mild spasticity (mAS < 3), able to understand and follow the instructions (MMSE > 24); Exclusion criteria: participation in another study or experimental rehabilitation project < 6 months, serious visual or visual perception impairment (e.g. neglect and poor visual fields) assessed by NIHSS, severe neuropsychologic, neuromuscular or orthopaedic disease
Interventions	2 arms: usual rehabilitation programme, additional:

Wu 2013 *(Continued)*

	1. MT: participants were instructed to observe their unaffected upper limb in mirror box while performing bilateral movements 2. Usual occupational therapy, task-oriented training: co-ordination, unilateral and bilateral fine-motor tasks, static and dynamic standing and sitting, balance, compensatory practice on functional tasks 1: 4 weeks, 5 days a week, 60 minutes a day of MT, followed by 30 minutes task-oriented training 2: 4 weeks, 5 days a week, 90 minutes a day Date of intervention: not stated
Outcomes	Outcomes were recorded at baseline, and after 4 weeks and 6 months after treatment 1. FM-UE (0 - 66 points) 2. Kinematic analysis 3. Revised Nottingham Sensory Assessment (3-point ordinal scale, total score 48 points, more points indicating better sensory function) 4. MAL 5. ABILHAND questionnaire (self-perceived arm use)
Notes	Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by randomly-selected numbered envelopes
Allocation concealment (selection bias)	Low risk	Allocation by sealed numbered envelopes
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessors were blinded to group allocation

Yavuzer 2008

Methods	RCT
Participants	Country: Turkey Setting: inpatient rehabilitation centre Age: adults (mean age: 63.3 years) Sample size: 40 participants (20 in each group; 4 dropped out at 6 months follow-up) Sex: 17 women, 19 men Inclusion criteria: 1st unilateral stroke during previous 12 months; a Brunnstrom recovery stage between 1 and 4 of the upper extremity; able to understand and follow simple instructions

Yavuzer 2008 *(Continued)*

	Exclusion criteria: severe cognitive disorders (MMSE < 24)
Interventions	2 arms 1. MT: participants were instructed to move both arms while looking in the mirror 2. Sham therapy: participants performed the same treatment protocol as in group 1 but with the non-reflecting side of the mirror 1 and 2: 5 days a week, 30 minutes of therapy for 4 weeks Date of intervention: February 2006 to April 2006
Outcomes	Outcomes were recorded at baseline, after 4 weeks and after 6 months 1. BRS upper extremity and hand (each 0 to 6) 2. FIM self-care items (6 to 42) 3. mAS (0 to 4)
Notes	We combined the Brunnstrom stages of upper extremity and hand into 1 item using raw data Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Block randomisation, computer-generated allocation of blocks
Allocation concealment (selection bias)	Low risk	The physicians who assessed potential participants to determine eligibility did not know to which group the participants would be allocated
Incomplete outcome data (attrition bias) All outcomes	High risk	Dropouts were not included in the analysis
Blinding of outcome assessment (detection bias) primary outcome	Low risk	Assessors were blinded to group allocation

Yoon 2014

Methods	RCT
Participants	Country: Republic of Korea Setting: inpatient rehabilitation centre Age: adults (mean age: 57.8 years) Sample size: 26 participants (8 in experimental group, 9 each in 2 control groups, no dropouts published) Sex: 10 women, 16 men Inclusion criteria: hemiplegia due to stroke < 6 weeks after onset, no past history of stroke, able to perform an active extension of the affected wrist and more than 2 fingers at an angle of > 10 ° and an active

Yoon 2014 *(Continued)*

	abduction of the affected thumb at an angle of > 10 °, capable of simple communication, can receive care by guardians or caregivers, able to maintain a sitting position for > 30 minutes Exclusion criteria: people with depression who were unable to co-operate in the treatment, not able to perform active task training due to musculoskeletal problems, spasticity of mAS II or higher, complex regional pain syndrome or secondary adhesive capsulitis
Interventions	3 arms 1, 2 and 3: conventional therapy 1. Additional CIMT + MT 2. Additional CIMT + self-exercise 3. Additional self-exercise 1, 2 and 3: 2 weeks, 5 days a weeks, 40 minutes a day of conventional therapy 1. Additional 2 hours, 3 times a day CIMT and 30 minutes MT a day 2. Additional 2 hours, 3 times a day CIMT and 30 minutes self-exercise a day 3. Additional 30 minutes, 2 times a day, self-exercise Date of intervention: October 2012 to May 2013
Outcomes	Outcomes were recorded at baseline and after 2 weeks of therapy 1. FMA-UE 2. BBT 3. 9-hole Pegboard test, 4. Grip strength 5. BRS 6. WMFT 7. Korean version of modified Barthel Index (K-MBI)
Notes	Funding source: 2-year research grant of Pusan National University, Republik of Korea Declarations of trialists' interests: there are no conflicts of interest

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned by random cards with numbers
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) primary outcome	Unclear risk	Not stated

Yun 2011

Methods	RCT
Participants	Country: South Korea Setting: inpatient rehabilitation centre Age: adults (mean age: 63.3 years) Sample size: 60 participants (40 in 2 experimental groups, 20 in control group, no dropouts published) Sex: 21 women, 39 men Inclusion criteria: 1st unilateral stroke; Brunnstrom recovery stage I - IV; MMSE > 21 Exclusion criteria: unco-operative due to cognitive impairment; medically unstable; neurologic deficit; neglect
Interventions	3 arms 1, 2 and 3: conventional rehabilitation programme, additional 1. MT: participants performed flexion and extension of fingers and wrist while looking in the mirror 2. Sham therapy: NMES was applied to extensor muscles on the paretic side and simultaneously underwent flexion and extension of fingers and wrist an the non-paretic side while looking at the wooden board 3. Combined MT and NMES 1, 2 and 3: 3 weeks, 5 days a week, 30 minutes MT, MT + NMES, or sham therapy Date of intervention: March 2009 to March 2010
Outcomes	Outcomes were recorded at baseline and after 3 weeks of treatment 1. FMA-UE 2. Manual muscle test 3. MAS
Notes	Published and unpublished information Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Random sampling number table as stated by authors (unpublished information)
Allocation concealment (selection bias)	High risk	Stated by authors (unpublished information)
Incomplete outcome data (attrition bias) All outcomes	High risk	Stated by authors (unpublished information)
Blinding of outcome assessment (detection bias) primary outcome	High risk	Assessors were not blinded; stated by authors (unpublished information)

Zacharis 2014

Methods	RCT
Participants	Country: Greece Setting: not stated Age: adults (age not stated) Sample size: 30 participants (15 in experimental group, 15 in control group, no dropouts published) Sex: not stated Inclusion criteria: > 4 weeks after stroke, upper limb plegia (Motricity Index ≤ 77) Exclusion criteria: not stated
Interventions	2 arms 1 and 2: routine rehabilitation treatment 1. Additional MT 2. No additional therapy 1 and 2: 8 weeks (20 - 24 sessions) 1: additional 30 minutes MT a day Date of intervention: March 2013 to November 2013
Outcomes	Outcomes were recorded at baseline and after 8 weeks of therapy 1. MI-UL 2. FIM
Notes	Information based on an abstract Funding source: not stated Declarations of trialists' interests: not stated

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Participants were randomly assigned (authors' statement)
Allocation concealment (selection bias)	Unclear risk	Not stated
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not stated
Blinding of outcome assessment (detection bias) primary outcome	Unclear risk	Not stated

ABILHAND: a measure of manual ability for adults with upper limb impairment

ADL: activities of daily living
ARAT: Action Research Arm Test
AS: Ashworth Scale
BBT: Box and Block Test
BF-FES: biofeedback functional electrical stimulation
BI: Barthel Index
BRS: Brunnstrom Recovery Stages
CAHAI: Chedoke Arm and Hand Activity Inventory
CIMT: Constraint-Induced Movement Therapy
CRPS-type 1: complex regional pain syndrome - type I
CT: computerised tomography
EMG: electromyography
EMGBF: electromyographic biofeedback
FAC: Functional Ambulatory Categories
FES: functional electrical stimulation
FIM: Functional Independence Measure
FM/FMA: Fugl-Meyer Assessment
FM-UE: Fugl-Meyer Assessment upper extremity
FM-LE: Fugl-Meyer Assessment lower extremity
FRT: functional reach test
GAS: goal attainment scaling
iEMG: integrated electro-myogram
ITT: intention-to-treat
JTHFT: Jebson Taylor Hand Function Test
LBT: Line Bisection Test
MAL: Motor Activity Log
MAS: Motor Assessment Scale
mAS: modified Ashworth Scale
MBI: modified Barthel index
MCSI: modified composite spasticity index
MFT: Manual Function Test
MI-UL: Motricity Index - upper limb
MMSE: Mini Mental State Examination
MMT: Manual Muscle Test
MoCA: Montreal Cognitive Assessment
MRC: Medical Research Council
MRI: magnetic resonance imaging
MT: mirror therapy
MVPT: Motor-free Visual Perception Test
NIHSS: National Institutes of Health Stroke Scales
NMES: neuromuscular electrical stimulation
NRS: Numeric Rating Scale
NSA: Nottingham Sensory Assessment
QOM: quality of movement
QST: quantitative sensory testing
RASP: Rivermead Assessment of Somatosensory Performance
RCT: randomised controlled trial
ROM: range of motion
rTMS: repetitive transcranial magnetic stimulation
SCT: Star Cancellation Test
SD: standard deviation
SIS: Stroke Impact Scale
SSQOL: Stroke-specific quality of life scale
tDCS: transcranial direct current stimulation
TEMPA: Upper Extremity Performance Evaluation Test for the Elderly (English title)
TS: Tardieu Scale
TUG: timed-up and go test
UEFI: Upper Extremity Functional Index
UEFT: Upper Extremity Function Test
Stroke-ULAM: Stroke Upper-Limb Activity Monitor
VAS: Visual analogue scale
WMFT: Wolf Motor Function Test

WMFT/FA: Wolf Motor Function Test - functional ability
WMFT/PT: Wolf Motor Function Test - performance time

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

Study	Reason for exclusion
Altschuler 2005	Study of healthy people
Dohle 2009b	Study did not use relevant outcomes
Ietswaart 2011	Only 10% of the experimental intervention was used for mirror therapy
Jax 2012	Mirror therapy is also part of the control intervention
Ji 2014b	No relevant outcomes included
Kim 2015b	The paper was withdrawn permanently, because of plagiarism (Wu 2013)
Lee 2014	Intervention was not mirror therapy as defined in this review
Lin 2014b	Control intervention included mirror therapy
Moseley 2004	Study did not include people after stroke
Radajewska 2013	Randomisation procedure not adequate
Ramachandran 1999	Study is not a RCT
Selles 2014	Time spent in mirror therapy did not reach inclusion criteria
Stevens 2003	Study is not an RCT
Vural 2016	Randomisation procedure not adequate

RCT: randomised controlled trial

Characteristics of studies awaiting assessment *[ordered by study ID]*

Amimoto 2008

Methods	Randomised cross-over trial
Participants	Country: Japan Sample size: 14 participants Inclusion criteria: 4 months and longer after stroke
Interventions	2 arms 1. Mirror therapy for the lower extremity; participants stepped over a columnar step of 3 cm height, 10 times 2. direct condition
Outcomes	• Ankle joint angle and time required for the task through a 2-D motion analysis software

Amimoto 2008 *(Continued)*

Notes	We were not able to include this trial because of unclear outcome of motor function

ISRCTN40903497

Methods	RCT
Participants	Country: Canada Inclusion criteria: adults, people with stroke, with normal vision, admitted to the rehabilitation programme at Toronto Rehabilitation Institute
Interventions	2 arms 1. Mirror therapy: bending and stretching exercises of the hip, knee and ankle, bilateral movements 2. Sham therapy: same type of movements, mirror is replaced with a non-reflective board
Outcomes	Outcomes: not stated
Notes	Information based on www.isrctn.com/ISRCTN40903497

Magni 2014

Methods	RCT
Participants	Country: not published Sample size: 10 (5 in experimental group, 5 in control group) Inclusion criteria: chronic stroke, paresis of the upper limb, aged 40 - 75 Exclusion criteria: not published
Interventions	2 arms 1. MT: at home 2. Sham therapy: at home 1 and 2: 6 weeks, 24 minutes twice a day
Outcomes	Outcomes were recorded: • FM-UE • ARAT • WMFT
Notes	Information based on abstract

May 2011

Methods	Cohort study (randomisation not published)
Participants	Country: not published

May 2011 *(Continued)*

	Sample size: 42 participants (21 in experimental group, 21 in control group) Inclusion criteria: stroke, paresis of the lower limb Exclusion criteria: not published
Interventions	2 arms 1 and 2: conventional therapy programme 1. MT 2. No additional therapy 1 and 2: 4 weeks, 5 days a week, 60 to 120 minutes conventional therapy programme 1: 4 weeks, 5 days a week, 30 minutes MT
Outcomes	Outcomes were recorded at baseline, after therapy period, and 12 weeks • Brunnstrom recovery stage (BRS) • Modified Ashworth Scale (MAS) • 6-metre walking test • Functional Ambulation Category (FAC) • MI • BBS • FIM
Notes	Information based on abstract

Wang 2013a

Methods	Cohort study (randomisation not published)
Participants	Country: not published Inclusion criteria: stroke, hemiplegia Exclusion criteria: not published
Interventions	2 arms 1 and 2: conventional therapy programme 1. Additional MT: upper limb 2. No additional therapy 1 and 2: 4 weeks
Outcomes	Outcomes were recorded at baseline, and 2 weeks and 4 weeks after therapy period • FM-UE • STEF • BI
Notes	Information based on abstract

Yeldan 2015

Methods	Cohort study (randomisation not published)
Participants	Country: Turkey Sample size: 8 participants (4 in experimental group, 4 in control group) Inclusion criteria: diagnosis of a stroke (within 1 month), partial anterior circulation infarction (PACI), upper extremity motor functional level according to Brunnstrom stages between 1 and 4, and no musculoskeletal injury history in the affected upper extremity Exclusion criteria: a residual upper extremity deficit from a previous stroke, intolerance to upright position, visual problem, cognitive deficit preventing them from following instructions, and unilateral neglect preventing them from being able to view the mirror
Interventions	2 arms 1 and 2: neurodevelopmental treatment 1. Additional MT: task-oriented activities (gross motor activities to fine motor) 2. No additional therapy
Outcomes	Outcomes were recorded at baseline and after therapy period • FM-UE • Ayres Sensory Integration Test • MI • Stroke Upper Limb Capacity Scale (SULCS) • BI • Finger identification and the right-left discrimination
Notes	

ARAT: Action Research Arm Test
BBS: Berg balance scale
BI: Barthel Index
FIM: functional independence measure
FM/FMA: Fugl-Meyer Assessment
FM-UE: Fugl-Meyer Assessment upper extremity
MI: Motricity Index
MT: Mirror therapy
RCT: Randomised controlled trial
STEF: Simple Test for Evaluating Hand Function
WMFT: Wolf Motor Function Test

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

ACTRN12613000121763

Trial name or title	Developing new ways to minimise disability after stroke, a randomized controlled trial of Functional Electrical Stimulation (FES) of the arm and mirror therapy
Methods	RCT
Participants	Country: New Zealand Inclusion criteria: over 18 years, admitted to Waikato Hospital with a confirmed diagnosis of stroke, living in the community within the Hamilton area on admission to hospital, a score of greater than 16/30 on MoCA, ARAT score of < 30/57

ACTRN12613000121763 *(Continued)*

	Exclusion criteria: severe cognitive impairment (< 16/30 on the MoCA), severe or unstable cardiovascular disease (i.e. unstable angina, pacemaker fitted, dysrhythmia other than controlled atrial fibrillation), near-terminal disease (including advanced lung, heart, kidney, liver failure resistant to medical management), acute musculoskeletal disorder
Interventions	3 arms 1, 2 and 3: task-specific training, additional 1. MT: progressively difficult functional tasks, attempting to mimic these tasks with the affected upper limb 2. MT + FES: same movements as MT group + FES as control group 3. Control therapy: FES- a rate of 45 Hz with a pulse width of 200 microseconds using a synchronous current; ramp-up time of 1 second, ramp-down time of 0.8 second and overall work:rest ratio of 8 seconds:8 seconds will be fixed 1, 2 and 3: 4 - 6 weeks, 2 times a day 30 minutes of task-specific training 1, 2 and 3: 4 - 6 weeks, 2 times a day 30 minutes of MT, MT + FES or FES
Outcomes	Outcomes will be recorded at baseline and after therapy period: • ARAT • NEADL • Hospital length of Stay • Disability support use • Duration and intensity of inpatient physiotherapy and occupational therapy • Cost-effectiveness evaluation
Starting date	Not stated
Contact information	Principal Investigator: Dr John Parsons, The University of Auckland, Auckland, New Zealand, Email: j.parsons@auckland.ac.nz
Notes	Estimated sample size: 100 participants (in 2 experimental groups and 1 control group) www.anzctr.org.au/Trial/Registration/TrialReview.aspx?ACTRN=12613000121763

ChiCTR-IOR-16008137

Trial name or title	Graded motor imagery based on mirror neuron on rehabilitative training for stroke patients: a BOLD-fMRI study
Methods	RCT
Participants	Country: China Inclusion criteria: participants signed informed consent, unconscious obstacles, condition is relatively stable, no obvious lack of eyesight, aged 40 - 75 years, no history of cerebrovascular disease, with cerebral infarction diagnosis standards, the course in 2 weeks to 3 months, right-handed, left hemiplegia, no metal implants in the body, no MRI testing taboo, NIHSS score > 4 minutes, paresis test positive, muscle strength level 1 - 3 Exclusion criteria: people who are not diagnosed with cerebral infarction by imaging, the acute stage of cerebrovascular diseases, unstable vital signs, persons with serious mental illness, with

ChiCTR-IOR-16008137 *(Continued)*

	understanding disabilities who cannot meet the test, persons with serious heart, liver and kidney dysfunction, those who have contraindications to MRI examination
Interventions	2 arms 1 and 2: routine training 1. Graded Motor Imagery Training
Outcomes	Outcomes: • FM-UE • MBI • muscle strength • Nine-hole Peg Test • BBT • JTHFT
Starting date	Not stated
Contact information	Principal Investigator: Tu Wenzhan, The Second Affiliated Hospital of Wenzhou Medical University, Wenzhou, China Email: tuwenzhan@163.com
Notes	Estimated sample size: 30 participants (in experimental group and in control group) www.chictr.org.cn/showprojen.aspx?proj=13608

DRKS00009288

Trial name or title	Zentrale Gesichtslähmung nach Schlaganfall: eine randomisierte, kontrollierte Studie [German]
Methods	RCT
Participants	Country: Germany Inclusion criteria: 1st episode of stroke with facial paresis (within 7 days to 6 months), 18 years of age and over Exclusion criteria: Speech disorder, which prevents understanding of the questionnaires, pre-existing brain lesions, degenerative diseases of the brain
Interventions	4 arms 1 to 4: training of oral motor skills (MMT) 1. Additional MT 2. Additional MMT 3. Additional taping of the affected side of the face 4. No additional therapy 1 to 4: 3 weeks, 4 days a week, 30 minutes a day MMT 1 and 2: 3 weeks, 4 days a week, 30 minutes a day additional MMT or additional MT
Outcomes	Outcomes will be recorded at baseline and after treatment

DRKS00009288 *(Continued)*

	• House-Brackmann-score (1 to 6) • Facial Clinimetric Evaluation scale (FaCE)
Starting date	October 2015
Contact information	Moritz Klinik Bad Klosterlausnitz, Hermann-Sachse Strasse 46, 07639 Bad Klosterlausnitz, Deutschland
Notes	Estimated sample size: 80 participants www.drks.de/drks_web/navigate.do?navigationId=trial.HTML&TRIAL_ID=DRKS00009288

IRCT201504224787N5

Trial name or title	The effect of mirror therapy on motor ability of patients after stroke
Methods	RCT
Participants	Country: Iran Inclusion criteria: people with age between 30 to 65 years, with the 1st-ever stroke that are diagnosed by neurologists and confirmed by computed tomography or magnetic resonance imaging, 1 month has passed since their stroke, 1 to 4 point from Brunnstrom scale, not to have severe cognitive disorders and be able follow simple verbal instructions (MMSE score > 24). Exclusion criteria: participants excluded if they do not participate in 4 sessions intermittently or 2 sessions constantly in intervention
Interventions	3 arms 1, 2 and 3: conventional rehabilitation programme 1. MT 2. Sham therapy (covered mirror)
Outcomes	Outcomes will be recorded before intervention and the end of 5, 10, 15, and 20 sessions • Brunnstrom recovery movement tool • Functional Ambulation Classification
Starting date	23 July 2015
Contact information	Principal Investigator: Tahereh Khaleghdoost Mohammadi, Physiotherapy centre for elderly and handicap city of Rasht, Rasht, Iran Email: khaleghdoost@gums.ac.ir
Notes	Estimated sample size: 93 participants (in 1 experimental group and 2 control groups) www.irct.ir/searchresult.php?id=4787&number=5

NCT01010607

Trial name or title	Use of tendon vibration and mirror for the improvement of upper limb function and pain reduction

NCT01010607 *(Continued)*

Methods	RCT
Participants	Country: Israel Inclusion criteria: stroke; 18 to 85 years of age; stroke onset between 1 month and 1 year ago; NIHSS 3 to 15 on study admission; affected upper-limb function 10% to 90% on Fugl-Meyer Scale; ability to understand instructions and to move the unaffected limb freely Exclusion criteria: severe cognitive impairment; severe aphasia; severe neglect that impairs ability to understand instructions or to execute tasks
Interventions	3 arms 1. Mirror therapy: moving the healthy hand while watching the mirror 2. Tendon vibration and mirror therapy: vibration of 50 Hz to 100 Hz administrated to the elbow and wrist muscles together with the use of a mirror 3. No mirror and sham vibration: moving both hands, the affected hand covered, sham vibration on bones 1, 2 and 3: 10 sessions, 30 minutes each
Outcomes	Outcomes will be assessed after treatment and 3 months after treatment • FM-UE • FIM
Starting date	September 2009
Contact information	Principal Investigator: Elior Moreh, MD, Hadassah University Hospital, Jerusalem, Israel Email: elior@hadassah.org.il
Notes	Estimated enrolment: 30 clinicaltrials.gov/ct2/show/NCT01010607

NCT01724164

Trial name or title	Robot- versus mirror-assisted motor interventions in rehabilitating upper-limb motor and muscle performance and daily functions post-stroke: a comparative effectiveness study
Methods	RCT
Participants	Country: Taiwan Inclusion criteria: willing to provide written informed consent, > 6 months onset of unilateral stroke, an initial 25 - 56 or 18 - 50 scores of the FM-UE, sufficient cognitive ability (MMSE ≧ 24 points), without upper limb fracture within 3 months, 40 years to 75 years of age Exclusion criteria: recurrence of stroke or seizure episode during the intervention, occurrence of serious or continuous pain on affected upper extremity, history of other neurological disease or severe orthopaedic condition
Interventions	5 arms 1. Experimental: RR with FES: participants receive FES concurrently with RR 2. Experimental: MT: bilateral 3. Experimental: RR

NCT01724164 *(Continued)*

	4. Conventional Rehabilitation (CR): mainly focuses on occupational therapy training; neuro-developmental techniques and task-oriented approach 5. RR with placebo Intervention (RR-PI) 1 to 5: 4 weeks, 5 days a week, 1 hour MT, RR, RR with FES, CR, or RR-PI and ½ hour functional training a day
Outcomes	Outcomes: • FM-UE
Starting date	August 2011
Contact information	Principal Investigator: Keh-chung Lin, ScD, School of Occupational Therapy, College of Medicine, National Taiwan University
Notes	Estimated sample size: 100 participants (in 3 experimental groups and 2 control groups) clinicaltrials.gov/ct2/show/record/NCT01655446 clinicaltrials.gov/ct2/show/record/NCT01724164

NCT02254616

Trial name or title	Hybrid approach to mirror therapy and transcranial direct current stimulation for stroke recovery: a follow-up study on brain reorganisation, motor performance of upper extremity, daily function, and activity participation
Methods	RCT
Participants	Country: Taiwan Inclusion criteria: 1st episode of stroke in cortical regions, time since stroke > 6 months, initial motor part of UE of FMA score ranging from 24 to 52, indicating moderate to mild movement impairment, no severe spasticity in any joints of the affected arm (mAS ≤ 2), no serious cognitive impairment (i.e. MMSE score ≧ 24), willing to sign the informed consent form Exclusion criteria: visual/attention impairments that might interfere with seeing mirror illusion, including hemineglect/hemianopsia, major health problems or poor physical conditions that might limit participation, currently participating in any other research, previous brain neurosurgery, metallic implants within the brain
Interventions	4 arms 1. MT with tDCS: tDCS at 1.5 mA current intensity followed by mirror therapy and functional training during the 1st 2 weeks, pure mirror therapy during the last 2 weeks, and followed by functional training 2. MT with sham-tDCS: sham-tDCS followed by a 40-minute mirror therapy and 30-minute functional training during the 1st 2 weeks, pure mirror therapy during the last 2 weeks, and followed by a 30-minute functional training 3. MT: MT followed by functional training 4. Control intervention: conventional stroke rehabilitation training followed by functional training 1: 2 weeks, 20 minutes tDCS, 40 minutes MT, 30 minutes functional training; 2 weeks 60 minutes MT and 30 minutes functional training 2: 2 weeks, 20 minutes sham tDCS, 40 minutes MT, 30 minutes functional training; 2 weeks 60 minutes MT and 30 minutes functional training

NCT02254616 *(Continued)*

	3: 4 weeks, 60 minutes MT and 30 minutes functional training
Outcomes	Outcomes will be recorded at baseline, after 2 weeks, after 4 weeks, 16 weeks, and 28 weeks • WMFT • MAL • rNSA • Stroke Impact Scale
Starting date	August 2014
Contact information	Principal Investigator: Ching-Yi Wu, ScD, Chang Gung Memorial Hospital, Taipei City,Taiwan Email: cywu@mail.cgu.edu.tw
Notes	Estimated sample size: 80 participants (in 3 experimental groups and 1 control group) clinicaltrials.gov/ct2/show/record/NCT02254616

NCT02276729

Trial name or title	A pilot randomised controlled trial (RCT) of mirror box therapy in upper limb rehabilitation with sub-acute stroke patients
Methods	RCT
Participants	Country: UK Inclusion criteria: 18 years and over; newly-admitted inpatient of the rehabilitation ward; diagnosis of CVA in the last 3 months resulting in upper-limb motor loss; able to follow 2-part spoken or written commands in the English language; upper-limb therapy designated as a main portion of goal directed treatment programme; consent to take part in the study Exclusion criteria: not stated
Interventions	2 arms 1 and 2: standard occupational therapy for upper limb rehabilitation 1. Additional Mirror therapy: AROM, functional tasks with objects, and object manipulation 2. No additional therapy 1 and 2: 6 weeks, 3 - 5 sessions a week of approximately 45 minutes OT
Outcomes	Outcomes will be recorded at baseline and after treatment and 3 and 6 months after treatment • FIM/FAM (Version 4) • gWMFT • EQ-5D-5L (cost-consequence analysis)
Starting date	April 2015
Contact information	Principal Investigator: Alison Porter-Armstrong, DPhil, University of Ulster, Belfast, Northern Ireland Email: a.porter@ulster.ac.uk
Notes	Estimated sample size: 50 participants (25 in experimental group and 25 in control group)

NCT02276729 *(Continued)*

	clinicaltrials.gov/show/NCT02276729

NCT02319785

Trial name or title	Effects of robot-assisted combined therapy in upper limb rehabilitation in stroke patients
Methods	RCT
Participants	Country: Taiwan Inclusion criteria: 1st-ever unilateral stroke with more than 3 months onset, an initial UE subsection of the Fugl-Meyer Assessment score of 18 to 56 indicating moderate to severe and moderate upper-limb movement impairment, no excessive spasticity in any of the joints of the affected upper limb (shoulder, elbow, wrist, fingers), be able to follow study instructions and perform study tasks, and willing to provide written informed consent Exclusion criteria: with neural or psychological medical problem that may influence the study, with severe joint pain, with upper limb fracture within 3 months, participation in any experimental rehabilitation or drug studies during the study period; and refusing to provide written informed consent
Interventions	6 arms 1 to 6: OT, additional 1. Robot-assisted therapy (RAT)-MT: combined treatment of RAT and MT 2. RAT-neuromuscular electrical stimulation (NMES): combined treatment of RAT and NMES 3. Unilateral RAT: warm-up, unilateral RAT, and functional activities training, device: InMotion Isokinetic Testing and Evaluation System 4. MT: bilateral motion in a mirror box, and look into mirror while practising, additional functional training 5. Bilateral RAT: warm-up, bilateral RAT, and functional activities training, device: Bi-Manu-Track 6. Conventional therapy: neuro-developmental techniques and task-oriented approach 1 to 6: 4 weeks, 5 days a week, 90 minutes OT
Outcomes	Outcomes will be recorded within 3 days and immediately after therapy period • FM-UE • Kinematic analysis • 10-metre walk test • WMFT • FIM
Starting date	August 2014
Contact information	Principal Investigator: Chia-Yi Lee, MD, Cathay General Hospital, Taipei City, Taiwan
Notes	Estimated sample size: 120 participants (in 3 experimental groups and 3 control groups) clinicaltrials.gov/ct2/show/record/NCT02319785

NCT02432755

Trial name or title	Effects of home-based mirror therapy combined with task-oriented training for patients with stroke: a randomised controlled trial
Methods	RCT
Participants	Country: Taiwan Inclusion criteria: diagnosed as having a unilateral stroke, at least 3 months after stroke onset, from 20 to 80 years of age, having completed acute rehabilitation care or discharged home, a baseline score of the Fugl-Meyer Assessment (FMA) of 20 to 60, able to follow the therapy instructions (cognition status will be measured by the Montreal Cognitive Assessment), capable of participating in therapy and assessment sessions Exclusion criteria: neglect, global or receptive aphasia, major medical problems, comorbidities that influenced UE usage or caused severe pain
Interventions	3 arms 1. Home-based MTOT: MT followed by task-oriented training (TOT) in home environment, bilateral movements 2. Hospital-based MTOT: MT followed by task-oriented training in a hospital 3. Hospital-based therapy: individualised occupational therapy, type of movements, e.g. passive range of motion exercises, fine motor or dexterity training, arm exercises or gross motor training, activities of daily living training or functional task practice 1 and 2: 4 weeks (12 sessions), 3 days a week, 30 minutes MT followed by 30 minutes TOT
Outcomes	Outcomes will be recorded at baseline, immediately after treatment, and 3 months follow-up • MRS • FM-UE • BBT • Grip and pinch power • MAL • rNSA • BI • Stroke Impact Scale • ActiGraph • NEADL • participant-reported fatigue and pain ratings • satisfaction questionnaire • WHOQOL-BREF
Starting date	March 2016
Contact information	Principal investigator: not stated, Chang Gung Memorial Hospital, Taipei City, Taiwan Email: not stated
Notes	Estimated sample size: 90 participants (in 2 experimental groups and 1 control group) ClinicalTrials.gov/show/NCT02432755

NCT02548234

Trial name or title	Effect of mirror therapy versus bilateral arm training for rehabilitation after chronic stroke: a pilot randomised controlled trial
Methods	RCT
Participants	Country: Taiwan Inclusion criteria: > 6 months after onset of an ischaemic or haemorrhage stroke, no excessive spasticity on any joints of the affected arm, aged 21 years and older Exclusion criteria: history of stroke or other neurologic, neuromuscular, or orthopaedic disease; participation in other experimental rehabilitation or drug studies concurrent with this study
Interventions	2 arms 1 and 2: home programme 1. Mirror therapy (MT) 2. Bilateral arm training 1 and 2: 4 weeks, 3 days a week, 1½ hours/day MT or bilateral arm training 1 and 2: 4 weeks, 5 days a week, ½ hour home programme
Outcomes	Outcomes will be assessed within 4 weeks (± 3 days) after intervention • Revised Nottingham Sensory Assessment (rNSA) • FM-UE • Myoton-3 (to measure muscular properties) • ActiGraph GT3X accelerometer (to measure movement capabilities of daily function)
Starting date	September 2015
Contact information	Principal Investigator: Keh-chung Lin, ScD, School of Occupational Therapy, College of Medicine, National Taiwan University
Notes	Estimated sample size: 60 participants (in experimental group and in control group) clinicaltrials.gov/ct2/show/record/NCT02548234

NCT02776306

Trial name or title	Effects of mirror box therapy on neuroplasticity and functional outcome in hemiparetic upper limb post-stroke
Methods	Randomised cross-over trial
Participants	Country: UK Inclusion criteria: 18 years to 105 years, hemiparetic upper limb post-stroke, capable of providing informed consent, intact vision: if diagnosis of peripheral field defect, participant should be able to compensate for it Exclusion criteria: any contraindication to MRI scanning, clinically-significant psychiatric disorder (e.g. depression), pre-existing neurological or psychiatric disease that could confound the study results
Interventions	2 arms

NCT02776306 *(Continued)*

	1. MT: MT + standard rehabilitation (3 weeks) followed by standard rehabilitation (3 weeks) 2. Standard treatment: vice versa
Outcomes	Outcomes will be recorded at baseline, after 3 weeks, and 6 weeks • BI • ARAT • FM-UE • Grip strength (Hand dynamometer)
Starting date	April 2016
Contact information	Principal Investigator: Iris Grunwald, Anglia Ruskin University, Cambridge, England
Notes	Estimated sample size: 40 participants (in experimental group and in control group) clinicaltrials.gov/ct2/show/record/NCT02776306

NCT02778087

Trial name or title	Self-directed box (mirror) therapy after stroke: a dosing study
Methods	RCT
Participants	Country: USA Inclusion criteria: adults status post-stroke (ischaemic or haemorrhagic) between the ages 18 and 85 years, receiving inpatient rehabilitation, using the impaired arm, ability to lift and release a wash cloth off a table with any means of prehension in either the sitting or standing positions, a score > 21/30 on the MMSE, ability to consent Exclusion criteria: serious visual or visual-perceptual deficits, neuropsychological impairments, or orthopaedic conditions that would prevent participation in the BT protocol as determined by the treatment team, involvement in another study protocol related to motor function after stroke, anticipated length of stay > 2 weeks, < 6 months post-stroke
Interventions	3 arms 1 to 3: treatment as usual 1. Self-directed mirror therapy: AROM, functional tasks with objects, and object manipulation. 2. Self-directed mirror therapy: same protocol as 1 3. Sham therapy: same protocol as 1 and 2, but with an opaque mirror 1: Additional 30 minutes MT a day (twice for 15 minutes) 2: Additional 60 minutes MT a day (4 times for 15 minutes)
Outcomes	Outcomes will be recorded at pre- and post-intervention up to 12 months • ARAT • Stroke Impact Scale • FIM • FM-UE
Starting date	January 2017

NCT02778087 *(Continued)*

Contact information	Principal Investigator: Glenn Gillen, EdD, OTR, Columbia University, New York City, USA E-mail: dmn12@cumc.columbia.edu (Dawn M. Nilsen EdD, OTR)
Notes	Estimated sample size: 45 participants (in 2 experimental groups and 1 control group) ClinicalTrials.gov/show/NCT02778087

NCT02827864

Trial name or title	Efficacy and time dependent effects of transcranial direct current stimulation (tDCS) combined with mirror therapy for rehabilitation after subacute and chronic stroke
Methods	RCT
Participants	Country: Taiwan Inclusion criteria: experienced a 1st-ever unilateral stroke with stroke onset ≥ 1 week, UE-FMA score between 18 and 56, able to follow instructions to perform the tasks (MMSE ≥ 24) Exclusion criteria: participants are currently involved in other rehabilitation or drug research trial(s), have neurological or psychological disorders other than stroke, have joint contracture or excessive spasticity of the paretic upper limb that prohibits them performing the tasks, received Botulinum toxin injections 3 months prior to enrolment, have unstable cardiovascular status such as uncontrolled hypertension or New York Heart Association (NYHA) Class III/IV heart failure, have contradictions to tDCS including a history of epilepsy, migraine headache, uncontrolled medical status, being pregnant, having a pacemaker, or metal implanted in their head or body, have a history of drug or alcohol abuse, skin lesions on the electrode sites, brain tumour, brain injury, arteriovenous malformation (AVM), had brain surgery, other brain diseases (such as intracranial hypertension or cerebral oedema), or being not suitable for using tDCS by the physician's assessment.
Interventions	3 arms 1. Sequentially apply tDCS and MT: tDCS applied over M1 lesioned without any active arm practice, followed by MT + sham tDCS, followed by MT without tDCS and functional task practice 2. Concurrently apply tDCS and MT: sham tDCS applied over M1 lesioned without any active arm practice, followed by MT + tDCS, followed by MT without tDCS and functional task practice 3. Sham tDCS and MT: sham tDCS applied over M1 lesioned without any active arm practice, followed by MT + sham tDCS, followed by MT without tDCS and functional task practice 1: 4 weeks, 5 days a week, 90 minutes: 20 minutes tDCS, 20 minutes MT + sham tDCS, 20 minutes MT without tDCS, 30 minutes functional task practice 2: 4 weeks, 5 days a week, 90 minutes: 20 minutes sham tDCS, 20 minutes MT + tDCS, 20 minutes MT without tDCS, 30 minutes functional task practice
Outcomes	Primary outcomes will be recorded at baseline, and after 4 weeks therapy period • FM-UE • rNSA • Myoton-pro & MAS • WMFT • MAL & MRC • ActiGraph • ABILHAND & NEADL
Starting date	August 2016

NCT02827864 *(Continued)*

Contact information	Contact: Ching-Yi Wu, ScD, Chang Gung Memorial Hospital, Taipei City, Taiwan E.mail: cywu@mail,cgu.edu.tw
Notes	Estimated sample size: 99 participants (in 2 experimental groups and 1 control group) ClinicalTrials.gov/show/NCT02827864

NCT02871700

Trial name or title	Comparative efficacy study of action observation therapy and mirror therapy after stroke: rehabilitation outcomes and neural mechanisms by MEG
Methods	RCT
Participants	Country: Taiwan Inclusion criteria: diagnosed as having a unilateral stroke, 1 to 6 months after stroke onset, from 20 to 80 years of age, a baseline score of the Fugl-Meyer Assessment (FMA) of 20 to 60, able to follow the study instructions (measured by the MoCA), capable of participating in therapy and assessment sessions Exclusion criteria: people with global or receptive aphasia, severe neglect, major medical problems, or comorbidities that influenced UE usage or cause severe pain
Interventions	3 arms 1. Action observation therapy: observe everyday life actions of which they had motor experience or the actions belong to the motor repertoire of observers: AROM exercises, reaching movement or object manipulation, and UE functional tasks practice 2. Mirror therapy: AROM exercises (10 to 15 minutes), reaching movement or object manipulation (15 to 20 minutes), and functional tasks practice (30 minutes) in a mirror box 3. Customary bilateral UE training: AROM exercises (10 to 15 minutes), reaching movement or object manipulation (15 to 20 minutes), and functional tasks practice (30 minutes) 1: 3 weeks, 15 sessions 2: 3 weeks, 15 sessions, 60 minutes MT
Outcomes	Outcomes will be recorded at baseline and after treatment and 3 months after treatment • MRS • WMFT • BBT • MRC • MAL • CAHAI • rNSA • ABILHAND • QMI • FIM • Stroke Impact Scale • ActiGraph • Magnetoencephalography • Visual analogue scale for pain, for fatigue

NCT02871700 *(Continued)*

Starting date	August 2016
Contact information	Contact: Yu-Wei Hsieh, PhD, Chang Gung Memorial Hospital, Taipei City, Taiwan E-mail: ywhsieh@mail.cgu.edu.tw
Notes	Estimated sample size: 90 participants (60 in 2 experimental groups and 30 in control group) clinicaltrials.gov/ct2/show/record/NCT02871700

ABILHAND: a measure of manual ability for adults with upper limb impairment
ARAT: Action Resarch Arm Test
AROM: active range of motion
BBT: Box and Block test
CAHAI: Chedoke arm and hand activity inventory
EQ-5D-5L: health questionnaire for adults
FES: Functional electrical stimulation
FAM: Functional Assessment Measure
FIM: Functional Independence Measure
FM-UE: Fugl-Meyer Assessment- upper extremity
gWMFT: Graded Wolf Motor Function Test
Hz: Hertz
JTHFT: Jebson Taylor Hand Function Test
MAL: Motor Activity Log
MAS: Motor Assessment Scale
mAS: Modified Ashworth Scale
mBI: Modified Barthel Index
MMSE: Mini Mental State Examination
MoCA: Montreal cognitive assessment
MRC: Medical research council Scale for Muscle Strength
MRI: magnetic resonance imaging
mRS: Modified Rankin scale
MT: Mirror therapy
NEADL: Nottingham Extended Activities of Daily Living Scale
NIHSS: National Institutes of Health Stroke Scales
NMES: Neuromuscular Electrical Stimulation
OT: occupational therapy
QMI: Questionnaire upon Mental Imagery
RCT: randomised controlled trial
rNSA: Revised Nottingham sensory assessment
RR: robotic rehabilitation
tDCS: Transcranial direct current stimulation
UE: upper extremity
(WHOQOL)-BREF: World Health Organization Quality of Life
WMFT: Wolf Motor Function Test

DATA AND ANALYSES

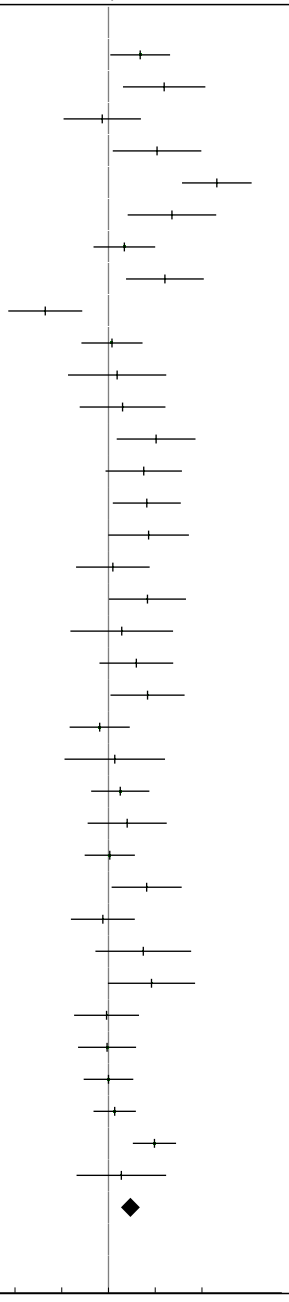
Comparison 1. Mirror therapy versus all other interventions: primary and secondary outcomes

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Motor function at the end of intervention phase	36		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1.1 All outcome measures	36	1173	Std. Mean Difference (IV, Random, 95% CI)	0.47 [0.27, 0.67]
2 Motor impairment at the end of intervention phase	39		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
2.1 All outcome measures	39	1292	Std. Mean Difference (IV, Random, 95% CI)	0.49 [0.32, 0.66]
3 Fugl-Meyer Assessment upper extremity at the end of intervention phase	28	898	Mean Difference (IV, Random, 95% CI)	4.32 [2.46, 6.19]
4 Activities of daily living at the end of intervention phase	19		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
4.1 All outcome measures	19	622	Std. Mean Difference (IV, Random, 95% CI)	0.48 [0.30, 0.65]
5 Pain at the end of intervention phase	6		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
5.1 All outcome measures	6	248	Std. Mean Difference (IV, Random, 95% CI)	-0.89 [-1.67, -0.11]
6 Visuospatial neglect at the end of intervention	5		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
6.1 All outcome measures	5	175	Std. Mean Difference (IV, Random, 95% CI)	1.06 [-0.10, 2.23]
7 Motor function at follow-up after 6 months	2		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
7.1 All outcome measures	2	88	Std. Mean Difference (IV, Random, 95% CI)	1.20 [-0.78, 3.18]
8 Motor impairment at follow-up after 6 months	3		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
8.1 All outcome measures	3	109	Std. Mean Difference (IV, Random, 95% CI)	0.69 [0.26, 1.12]
9 Dropouts at the end of intervention phase	42	1438	Odds Ratio (M-H, Random, 95% CI)	1.14 [0.74, 1.76]

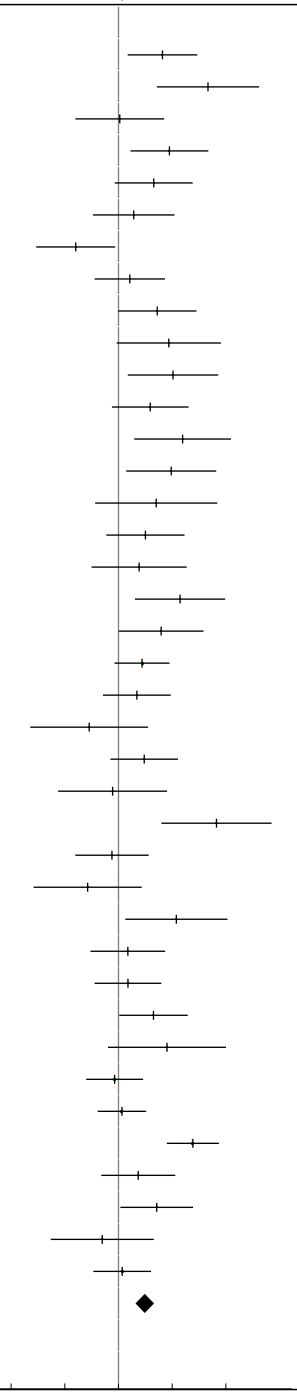
Analysis 1.1. Comparison 1 Mirror therapy versus all other interventions: primary and secondary outcomes, Outcome 1 Motor function at the end of intervention phase.

Study or subgroup	Experimental N	Experimental Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
1.1.1 All outcome measures							
Acerra 2007	20	3.7 (1.3)	20	2.8 (1.3)		3.2%	0.68[0.04,1.32]
Alibakhshi 2016	12	7.6 (7.7)	12	0.8 (1.2)		2.48%	1.19[0.31,2.07]
Amasyali 2016	9	13.9 (11.2)	15	15.8 (15)		2.63%	-0.13[-0.96,0.69]
Bae 2012	10	17.1 (3)	10	14.2 (2.3)		2.31%	1.04[0.09,1.99]
Cacchio 2009a	24	-1.5 (0.7)	24	-3.4 (0.9)		2.87%	2.32[1.57,3.06]
Cacchio 2009b	8	-2.2 (0.7)	16	-3.7 (1.2)		2.31%	1.36[0.41,2.3]
Cha 2015	19	56.7 (11)	17	53.1 (9.6)		3.13%	0.34[-0.32,1]
Cho 2015	14	37.2 (9.6)	13	25.6 (9)		2.62%	1.21[0.38,2.04]
Colomer 2016	15	10.1 (1.8)	16	12.6 (1.8)		2.73%	-1.35[-2.14,-0.56]
Dohle 2009	18	4.7 (12.5)	18	3.9 (7.9)		3.15%	0.07[-0.58,0.73]
Hiragami 2012	7	2.9 (1)	7	2.6 (1.9)		2.07%	0.18[-0.87,1.24]
In 2012	11	22.4 (4)	8	21 (5)		2.39%	0.3[-0.62,1.22]
In 2016	13	49.1 (2.7)	12	46.1 (3)		2.58%	1.02[0.18,1.86]
Invernizzi 2013	13	47.6 (15.2)	12	33.7 (20.3)		2.66%	0.75[-0.06,1.57]
Ji 2014a	23	45.5 (12.4)	12	35.5 (10.9)		2.92%	0.82[0.09,1.55]
Kim 2014	12	12.4 (3.5)	11	9.6 (2.7)		2.53%	0.86[-0,1.72]
Kim 2015a	20	13.6 (9.2)	9	12.6 (12.8)		2.74%	0.09[-0.69,0.88]
Kim 2016	12	36.2 (3.4)	13	33.4 (3.1)		2.64%	0.83[0.01,1.66]
Kojima 2014	6	45.2 (13)	7	40.1 (19.3)		1.97%	0.28[-0.81,1.38]
Lee 2012	13	11.4 (2.7)	13	9.3 (4)		2.74%	0.6[-0.19,1.38]
Lee 2016	14	46.3 (4.2)	13	37.6 (13.9)		2.73%	0.84[0.04,1.63]
Lin 2014a	28	17.1 (14.3)	14	19.9 (15.2)		3.18%	-0.19[-0.83,0.45]
Marquez 2012	5	1 (1.4)	10	0.8 (1.4)		2.02%	0.13[-0.94,1.21]
Michielsen 2011	20	25.5 (17.4)	20	21.1 (16.8)		3.25%	0.25[-0.37,0.87]
Mohan 2013	11	5.4 (0.8)	11	4.9 (1.5)		2.58%	0.4[-0.45,1.25]
Nagapattinam 2015	40	28.7 (11.5)	20	28.4 (9.1)		3.53%	0.03[-0.51,0.56]
Park 2015b	15	49.4 (16.9)	15	37.3 (11.4)		2.85%	0.82[0.07,1.57]
Piravej 2012	17	0.6 (0.9)	16	0.7 (0.7)		3.06%	-0.12[-0.8,0.56]
Rodrigues 2016	8	51 (16.2)	8	32.5 (29)		2.13%	0.74[-0.28,1.77]
Samuelkamaleshkumar 2014	10	6.6 (8.4)	10	0.7 (2.2)		2.35%	0.92[-0.01,1.85]
Schick 2017	15	5.9 (9.2)	17	6.3 (9.7)		3.02%	-0.04[-0.74,0.65]
Seok 2010	19	17.6 (10.5)	21	17.9 (8.9)		3.26%	-0.03[-0.65,0.59]
Thieme 2013	39	3.1 (8.9)	21	3.1 (7.1)		3.55%	0[-0.53,0.53]
Tyson 2015	57	20 (23)	28	17 (21)		3.8%	0.13[-0.32,0.59]
Wang 2015	30	73.5 (7.2)	60	63 (11.9)		3.77%	0.98[0.52,1.45]
Yoon 2014	8	51.5 (18.3)	9	45.7 (21.4)		2.28%	0.28[-0.68,1.23]
Subtotal ***	**615**		**558**			**100%**	**0.47[0.27,0.67]**
Heterogeneity: Tau^2=0.23; Chi^2=91.89, df=35(P<0.0001); I^2=61.91%							
Test for overall effect: Z=4.55(P<0.0001)							



Analysis 1.2. Comparison 1 Mirror therapy versus all other interventions: primary and secondary outcomes, Outcome 2 Motor impairment at the end of intervention phase.

Study or subgroup	Experimental N	Experimental Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
1.2.1 All outcome measures							
Acerra 2007	20	13.7 (5.8)	20	9.6 (3.8)		2.96%	0.82[0.17,1.47]
Alibakhshi 2016	12	69 (7.4)	12	54.2 (9.6)		2%	1.67[0.72,2.62]
Amasyali 2016	9	48.7 (15.5)	15	48.3 (16.7)		2.35%	0.02[-0.8,0.85]
Arya 2015	17	30.4 (9.1)	16	23 (5.6)		2.68%	0.95[0.22,1.67]
Arya 2017	16	24.3 (8.1)	15	19 (7.6)		2.68%	0.66[-0.07,1.38]
Cho 2015	14	45.6 (8.8)	13	41.9 (15.8)		2.56%	0.28[-0.48,1.04]
Colomer 2016	15	8.6 (1.1)	16	9.5 (1.1)		2.64%	-0.8[-1.53,-0.06]
Dohle 2009	18	13.4 (3.2)	18	12.7 (3.3)		2.93%	0.21[-0.44,0.87]
Gurbuz 2016	16	27.1 (14.5)	15	17.3 (11.7)		2.66%	0.72[-0.01,1.45]
In 2012	11	59.5 (7.4)	8	49.6 (13)		1.95%	0.94[-0.03,1.91]
Invernizzi 2013	13	76 (21.8)	12	51.6 (24.7)		2.3%	1.02[0.17,1.86]
Ji 2014a	23	53.5 (9.6)	12	47.9 (8.5)		2.72%	0.59[-0.12,1.3]
Kim 2014	12	26.7 (8.7)	11	17.5 (5.7)		2.13%	1.19[0.29,2.1]
Kim 2016	12	36.9 (3.3)	13	33.6 (3.2)		2.31%	0.98[0.14,1.82]
Kojima 2014	6	46.2 (10.7)	7	35.6 (16.3)		1.59%	0.7[-0.43,1.84]
Kumar 2013	15	16.7 (3.2)	15	15.1 (3)		2.67%	0.5[-0.23,1.23]
Kuzgun 2012	10	30.8 (21.7)	10	23.2 (15.7)		2.17%	0.38[-0.5,1.27]
Lee 2012	13	36.3 (6.3)	13	27.9 (7.8)		2.31%	1.15[0.31,1.99]
Lee 2016	14	6.6 (3.1)	13	4.1 (3)		2.47%	0.79[0.01,1.58]
Lim 2016	30	41.4 (9)	30	37.4 (9)		3.51%	0.44[-0.07,0.95]
Lin 2014a	28	50.4 (9.1)	15	47.1 (10.1)		3.02%	0.34[-0.29,0.97]
Marquez 2012	5	3.6 (5)	10	6.3 (4.5)		1.67%	-0.55[-1.64,0.55]
Michielsen 2011	20	43.5 (14)	20	36.6 (14.2)		3.03%	0.48[-0.15,1.11]
Mirela 2015	7	46.5 (7.5)	8	47.3 (6.3)		1.84%	-0.11[-1.12,0.91]
Mohan 2013	11	25.4 (2.3)	11	17.4 (5.5)		1.82%	1.83[0.8,2.85]
Piravej 2012	17	2.4 (0.8)	16	2.5 (0.8)		2.83%	-0.12[-0.81,0.56]
Rodrigues 2016	8	41.4 (8.1)	8	46.8 (9.6)		1.86%	-0.57[-1.58,0.43]
Samuelkamaleshkumar 2014	10	30.8 (23.9)	10	8.8 (13.9)		2%	1.08[0.13,2.03]
Schick 2017	15	29.7 (14.4)	17	26.9 (16.7)		2.78%	0.17[-0.52,0.87]
Seok 2010	19	28.2 (11.7)	21	26.3 (9.4)		3.06%	0.18[-0.45,0.8]
Sütbeyaz 2007	20	3.5 (0.8)	20	3 (0.7)		3%	0.65[0.01,1.29]
Tezuka 2006	9	11.9 (6.2)	6	6.3 (5.2)		1.66%	0.9[-0.2,2]
Thieme 2013	39	8.4 (11.3)	21	9.2 (10.6)		3.43%	-0.07[-0.6,0.46]
Tyson 2015	57	49 (32)	28	47 (28)		3.76%	0.06[-0.39,0.52]
Wang 2015	30	41.1 (7.2)	60	31.5 (6.7)		3.62%	1.39[0.9,1.87]
Wu 2013	16	51.3 (8.1)	17	47.9 (9.8)		2.81%	0.37[-0.32,1.06]
Yavuzer 2008	17	3.6 (1.2)	19	2.8 (1)		2.85%	0.71[0.03,1.39]
Yoon 2014	8	47 (20)	9	53.3 (19.6)		1.98%	-0.3[-1.26,0.66]
Yun 2011	40	16 (11.3)	20	15.3 (6.9)		3.4%	0.07[-0.47,0.61]
Subtotal ***	**672**		**620**			**100%**	**0.49[0.32,0.66]**
Heterogeneity: Tau^2=0.15; Chi^2=81.27, df=38(P<0.0001); I^2=53.24%							
Test for overall effect: Z=5.55(P<0.0001)							

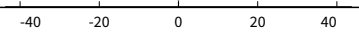


Analysis 1.3. Comparison 1 Mirror therapy versus all other interventions: primary and secondary outcomes, Outcome 3 Fugl-Meyer Assessment upper extremity at the end of intervention phase.

Study or subgroup	Experimental N	Experimental Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Alibakhshi 2016	12	69 (7.4)	12	54.2 (9.6)		3.52%	14.8[7.94,21.66]
Amasyali 2016	9	48.7 (15.5)	15	48.3 (16.7)		1.54%	0.4[-12.79,13.59]
Arya 2015	17	30.4 (9.1)	16	23 (5.6)		4.46%	7.4[2.28,12.52]
Cho 2015	14	45.6 (8.8)	13	41.9 (15.8)		2.37%	3.7[-6.05,13.45]
Colomer 2016	15	8.6 (1.1)	16	9.5 (1.2)		6.63%	-0.9[-1.71,-0.09]
Dohle 2009	18	13.4 (3.2)	18	12.7 (3.3)		6.18%	0.7[-1.42,2.82]
Gurbuz 2016	16	27.1 (14.5)	15	17.3 (11.7)		2.53%	9.8[0.55,19.05]
In 2012	11	59.5 (7.4)	8	49.6 (13)		2.29%	9.9[-0.11,19.91]
Ji 2014a	23	53.5 (9.6)	12	47.9 (8.5)		3.85%	5.6[-0.61,11.81]
Kim 2014	12	26.7 (8.7)	11	17.5 (5.7)		3.98%	9.2[3.24,15.16]
Kim 2016	12	36.9 (3.3)	13	33.6 (3.2)		5.96%	3.3[0.75,5.85]
Kojima 2014	6	46.2 (10.7)	7	35.6 (16.3)		1.28%	10.6[-4.2,25.4]
Kumar 2013	15	16.7 (3.2)	15	15.1 (3)		6.13%	1.6[-0.62,3.82]
Kuzgun 2012	10	30.8 (21.7)	10	23.2 (15.7)		1.06%	7.6[-9,24.2]
Lee 2012	13	36.3 (6.3)	13	27.9 (7.8)		4.27%	8.4[2.95,13.85]
Lim 2016	30	41.4 (9)	30	37.4 (9)		4.78%	4[-0.57,8.57]
Lin 2014a	28	50.4 (9.1)	15	47.1 (10.1)		3.9%	3.3[-2.82,9.42]
Michielsen 2011	20	43.5 (14)	20	36.6 (14.2)		2.71%	6.9[-1.84,15.64]
Mirela 2015	7	46.5 (7.5)	8	47.3 (6.3)		3.42%	-0.8[-7.87,6.27]
Rodrigues 2016	8	41.4 (8.1)	8	46.8 (9.6)		2.73%	-5.4[-14.1,3.3]
Samuelkamaleshkumar 2014	10	30.8 (23.9)	10	8.8 (13.9)		1.01%	22[4.86,39.14]
Schick 2017	15	29.7 (14.4)	17	26.9 (16.7)		2.07%	2.8[-7.98,13.58]
Tezuka 2006	9	11.9 (6.2)	6	6.3 (5.2)		4.07%	5.6[-0.21,11.41]
Thieme 2013	39	8.5 (11.3)	21	9.2 (10.6)		4.1%	-0.7[-6.46,5.06]
Wang 2015	30	41.1 (7.2)	60	31.5 (6.7)		5.67%	9.6[6.52,12.68]
Wu 2013	16	51.3 (8.1)	17	47.9 (9.8)		3.9%	3.4[-2.72,9.52]
Yoon 2014	8	47 (20)	9	53.3 (19.6)		0.85%	-6.3[-25.17,12.57]
Yun 2011	40	16 (11.3)	20	15.3 (6.9)		4.75%	0.7[-3.93,5.33]
Total ***	**463**		**435**			**100%**	**4.32[2.46,6.19]**

Heterogeneity: Tau²=13.49; Chi²=117.55, df=27(P<0.0001); I²=77.03%

Test for overall effect: Z=4.54(P<0.0001)



Other intervention — Mirror therapy

Analysis 1.4. Comparison 1 Mirror therapy versus all other interventions: primary and secondary outcomes, Outcome 4 Activities of daily living at the end of intervention phase.

Study or subgroup	Experimental N	Experimental Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
1.4.1 All outcome measures							
Dohle 2009	18	66.6 (9.4)	18	60.8 (13)		6.02%	0.5[-0.16,1.16]
Gurbuz 2016	16	19.8 (8.1)	15	16.9 (6.4)		5.36%	0.39[-0.33,1.1]
Hiragami 2012	7	37.7 (3.9)	7	33.1 (7.5)		2.49%	0.72[-0.37,1.81]
Invernizzi 2013	13	93.2 (22.1)	12	67.4 (13.2)		3.67%	1.36[0.47,2.24]
Kim 2015a	20	29.6 (4.3)	9	25.6 (2.3)		4.06%	1.02[0.18,1.85]
Kim 2016	12	77.3 (6.3)	13	72.6 (4.3)		4.15%	0.85[0.02,1.67]
Kojima 2014	6	1.1 (1)	7	0.7 (1.1)		2.45%	0.35[-0.75,1.45]

Other intervention — Mirror therapy

Study or subgroup	Experimental N	Experimental Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
Kuzgun 2012	10	72.6 (26.8)	10	63.9 (26)		3.68%	0.32[-0.57,1.2]
Lim 2016	30	59.6 (15.6)	30	51.4 (16.3)		9%	0.51[-0.01,1.02]
Lin 2014a	28	1.3 (2.6)	15	1.1 (1.3)		6.61%	0.09[-0.54,0.71]
Pandian 2014	26	3.2 (1)	19	2.5 (0.8)		6.86%	0.75[0.13,1.36]
Park 2015b	15	24.5 (5.7)	15	20 (5)		4.91%	0.82[0.07,1.57]
Piravej 2012	17	77.3 (12.6)	16	68.8 (12.6)		5.47%	0.66[-0.05,1.36]
Schick 2017	15	75.7 (20.9)	17	64.7 (23.7)		5.44%	0.48[-0.23,1.18]
Sütbeyaz 2007	20	65.9 (4.8)	20	61.7 (14.6)		6.64%	0.38[-0.25,1]
Thieme 2013	39	57 (16.6)	21	62.5 (22.8)		8.54%	-0.29[-0.82,0.25]
Wu 2013	16	1.5 (1.1)	17	1.6 (1.4)		5.75%	-0.08[-0.76,0.61]
Yavuzer 2008	17	28.9 (10)	19	22.2 (6.3)		5.76%	0.79[0.11,1.48]
Yoon 2014	8	66.3 (10.6)	9	60 (16.2)		3.13%	0.43[-0.54,1.4]
Subtotal ***	**333**		**289**			**100%**	**0.48[0.3,0.65]**
Heterogeneity: Tau^2=0.02; Chi^2=21.21, df=18(P=0.27); I^2=15.15%							
Test for overall effect: Z=5.21(P<0.0001)							

Other intervention -2 -1 0 1 2 Mirror therapy

Analysis 1.5. Comparison 1 Mirror therapy versus all other interventions: primary and secondary outcomes, Outcome 5 Pain at the end of intervention phase.

Study or subgroup	Experimental N	Experimental Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
1.5.1 All outcome measures							
Acerra 2007	20	0.1 (0.3)	20	0.6 (1.4)		18.15%	-0.48[-1.11,0.15]
Cacchio 2009a	24	4.3 (2.5)	24	7.2 (2.2)		18.22%	-1.21[-1.83,-0.59]
Cacchio 2009b	8	14.8 (4.5)	16	75.5 (11.6)		8.63%	-5.91[-7.93,-3.9]
Dohle 2009	18	1.7 (0.2)	18	1.7 (0.2)		17.99%	0[-0.65,0.65]
Michielsen 2011	20	8.8 (10.8)	20	9.2 (14.1)		18.22%	-0.03[-0.65,0.59]
Thieme 2013	39	-19.6 (4.3)	21	-18.1 (4.5)		18.78%	-0.34[-0.87,0.2]
Subtotal ***	**129**		**119**			**100%**	**-0.89[-1.67,-0.11]**
Heterogeneity: Tau^2=0.76; Chi^2=37.52, df=5(P<0.0001); I^2=86.68%							
Test for overall effect: Z=2.24(P=0.03)							

Mirror therapy -5 -2.5 0 2.5 5 Other intervention

Analysis 1.6. Comparison 1 Mirror therapy versus all other interventions: primary and secondary outcomes, Outcome 6 Visuospatial neglect at the end of intervention.

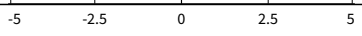
Study or subgroup	Experimental N	Experimental Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
1.6.1 All outcome measures							
Dohle 2009	14	48.1 (9.3)	9	31.2 (9.2)		19.85%	1.76[0.75,2.77]
Moustapha 2012	4	37.3 (18.3)	4	29 (20.3)		17.36%	0.37[-1.04,1.78]
Pandian 2014	26	37.8 (5.9)	19	24.1 (3.5)		20.86%	2.67[1.85,3.5]
Thieme 2013	8	44.9 (11)	6	39.7 (8.8)		19.41%	0.48[-0.6,1.56]
Tyson 2015	57	50 (11)	28	50 (11)		22.53%	0[-0.45,0.45]
Subtotal ***	**109**		**66**			**100%**	**1.06[-0.1,2.23]**
Heterogeneity: Tau^2=1.5; Chi^2=35.66, df=4(P<0.0001); I^2=88.78%							

Other intervention -5 -2.5 0 2.5 5 Mirror therapy

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
Test for overall effect: Z=1.8(P=0.07)							

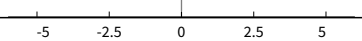
Analysis 1.7. Comparison 1 Mirror therapy versus all other interventions: primary and secondary outcomes, Outcome 7 Motor function at follow-up after 6 months.

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
1.7.1 All outcome measures							
Cacchio 2009a	24	-1.9 (1.2)	24	-4.2 (0.8)		49.53%	2.22[1.49,2.95]
Michielsen 2011	20	24.6 (18.7)	20	20.9 (17.6)		50.47%	0.2[-0.42,0.82]
Subtotal ***	**44**		**44**			**100%**	**1.2[-0.78,3.18]**
Heterogeneity: Tau^2=1.92; Chi^2=17, df=1(P<0.0001); I^2=94.12%							
Test for overall effect: Z=1.19(P=0.23)							



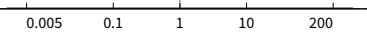
Analysis 1.8. Comparison 1 Mirror therapy versus all other interventions: primary and secondary outcomes, Outcome 8 Motor impairment at follow-up after 6 months.

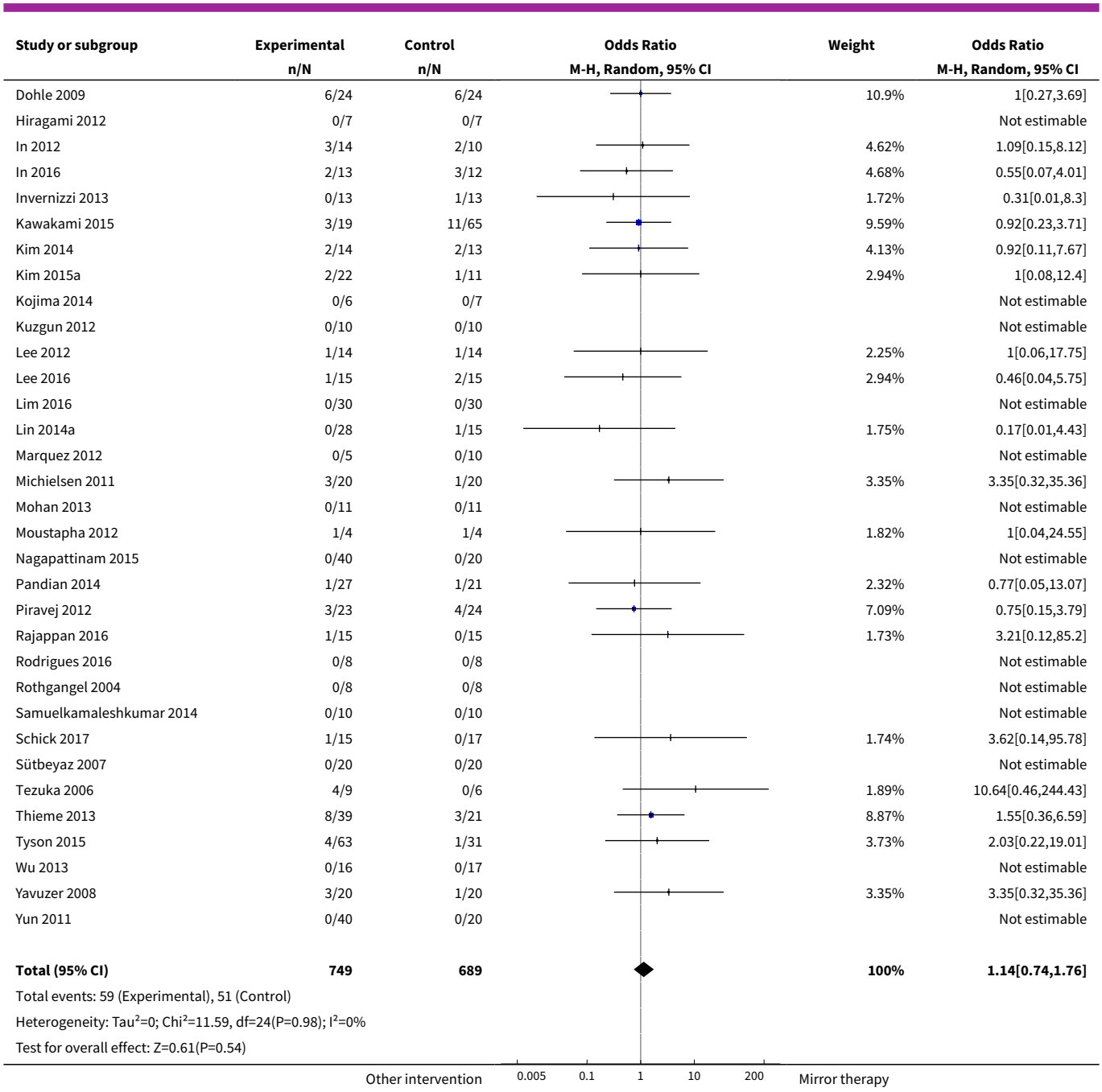
Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
1.8.1 All outcome measures							
Michielsen 2011	20	41.1 (14.9)	20	36.3 (16.2)		38.1%	0.3[-0.32,0.93]
Sütbeyaz 2007	17	4.2 (0.8)	16	3.4 (0.8)		29.59%	0.98[0.25,1.7]
Yavuzer 2008	17	4.2 (1.3)	19	3.1 (1.1)		32.3%	0.9[0.21,1.59]
Subtotal ***	**54**		**55**			**100%**	**0.69[0.26,1.12]**
Heterogeneity: Tau^2=0.03; Chi^2=2.42, df=2(P=0.3); I^2=17.49%							
Test for overall effect: Z=3.16(P=0)							



Analysis 1.9. Comparison 1 Mirror therapy versus all other interventions: primary and secondary outcomes, Outcome 9 Dropouts at the end of intervention phase.

Study or subgroup	Experimental n/N	Control n/N	Odds Ratio M-H, Random, 95% CI	Weight	Odds Ratio M-H, Random, 95% CI
Acerra 2007	0/20	0/20			Not estimable
Alibakhshi 2016	0/12	0/12			Not estimable
Altschuler 1999	0/4	0/5			Not estimable
Amasyali 2016	2/9	1/15		2.83%	4[0.31,52.06]
Arya 2015	0/17	1/16		1.74%	0.3[0.01,7.79]
Arya 2017	4/16	2/15		5.32%	2.17[0.33,14.06]
Cacchio 2009a	2/24	4/24		5.73%	0.45[0.07,2.76]
Cacchio 2009b	0/8	0/16			Not estimable
Colomer 2016	2/17	1/17		2.97%	2.13[0.17,26.03]





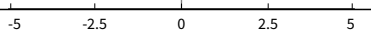
Comparison 2. Subgroup analysis: upper versus lower extremity

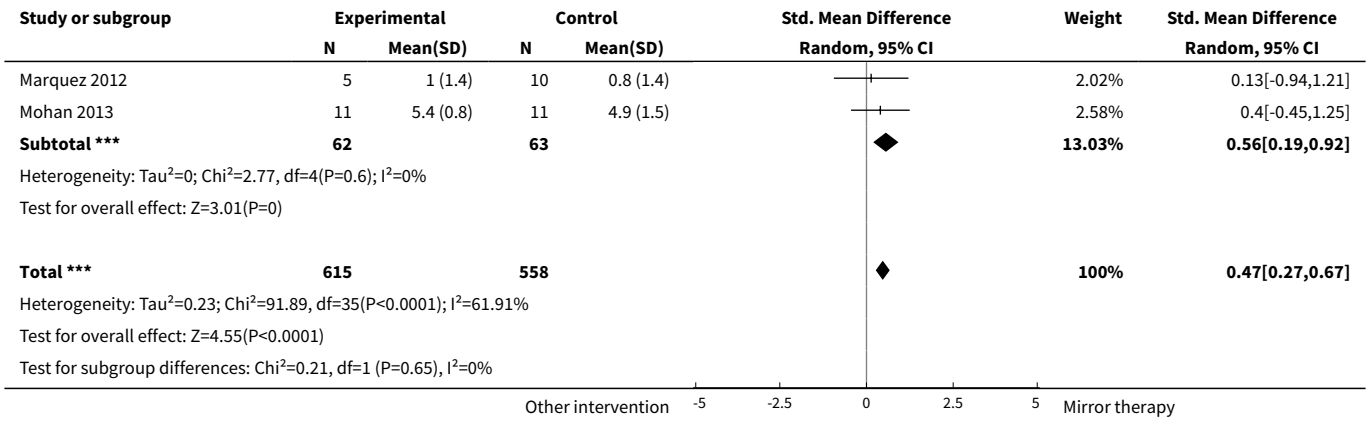
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Motor function at the end of intervention	36	1173	Std. Mean Difference (IV, Random, 95% CI)	0.47 [0.27, 0.67]
1.1 Mirror therapy for the upper extremity	31	1048	Std. Mean Difference (IV, Random, 95% CI)	0.46 [0.23, 0.69]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1.2 Mirror therapy for the lower extremity	5	125	Std. Mean Difference (IV, Random, 95% CI)	0.56 [0.19, 0.92]

Analysis 2.1. Comparison 2 Subgroup analysis: upper versus lower extremity, Outcome 1 Motor function at the end of intervention.

Study or subgroup	Experimental N	Experimental Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
2.1.1 Mirror therapy for the upper extremity							
Acerra 2007	20	3.7 (1.3)	20	2.8 (1.3)		3.2%	0.68[0.04,1.32]
Alibakhshi 2016	12	7.6 (7.7)	12	0.8 (1.2)		2.48%	1.19[0.31,2.07]
Amasyali 2016	9	13.9 (11.2)	15	15.8 (15)		2.63%	-0.13[-0.96,0.69]
Bae 2012	10	17.1 (3)	10	14.2 (2.3)		2.31%	1.04[0.09,1.99]
Cacchio 2009a	24	-1.5 (0.7)	24	-3.4 (0.9)		2.87%	2.32[1.57,3.06]
Cacchio 2009b	8	-2.2 (0.7)	16	-3.7 (1.2)		2.31%	1.36[0.41,2.3]
Cho 2015	14	37.2 (9.6)	13	25.6 (9)		2.62%	1.21[0.38,2.04]
Colomer 2016	15	10.1 (1.8)	16	12.6 (1.8)		2.73%	-1.35[-2.14,-0.56]
Dohle 2009	18	4.7 (12.5)	18	3.9 (7.9)		3.15%	0.07[-0.58,0.73]
Hiragami 2012	7	2.9 (1)	7	2.6 (1.9)		2.07%	0.18[-0.87,1.24]
In 2012	11	22.4 (4)	8	21 (5)		2.39%	0.3[-0.62,1.22]
Invernizzi 2013	13	47.6 (15.2)	12	33.7 (20.3)		2.66%	0.75[-0.06,1.57]
Ji 2014a	23	45.5 (12.4)	12	35.5 (10.9)		2.92%	0.82[0.09,1.55]
Kim 2014	12	12.4 (3.5)	11	9.6 (2.7)		2.53%	0.86[-0,1.72]
Kim 2015a	20	13.6 (9.2)	9	12.6 (12.8)		2.74%	0.09[-0.69,0.88]
Kim 2016	12	36.2 (3.4)	13	33.4 (3.1)		2.64%	0.83[0.01,1.66]
Kojima 2014	6	45.2 (13)	7	40.1 (19.3)		1.97%	0.28[-0.81,1.38]
Lee 2012	13	11.4 (2.7)	13	9.3 (4)		2.74%	0.6[-0.19,1.38]
Lin 2014a	28	17.1 (14.3)	14	19.9 (15.2)		3.18%	-0.19[-0.83,0.45]
Michielsen 2011	20	25.5 (17.4)	20	21.1 (16.8)		3.25%	0.25[-0.37,0.87]
Nagapattinam 2015	40	28.7 (11.5)	20	28.4 (9.1)		3.53%	0.03[-0.51,0.56]
Park 2015b	15	49.4 (16.9)	15	37.3 (11.4)		2.85%	0.82[0.07,1.57]
Piravej 2012	17	0.6 (0.9)	16	0.7 (0.7)		3.06%	-0.12[-0.8,0.56]
Rodrigues 2016	8	51 (16.2)	8	32.5 (29)		2.13%	0.74[-0.28,1.77]
Samuelkamaleshkumar 2014	10	6.6 (8.4)	10	0.7 (2.2)		2.35%	0.92[-0.01,1.85]
Schick 2017	15	5.9 (9.2)	17	6.3 (9.7)		3.02%	-0.04[-0.74,0.65]
Seok 2010	19	17.6 (10.5)	21	17.9 (8.9)		3.26%	-0.03[-0.65,0.59]
Thieme 2013	39	3.1 (8.9)	21	3.1 (7.1)		3.55%	0[-0.53,0.53]
Tyson 2015	57	20 (23)	28	17 (21)		3.8%	0.13[-0.32,0.59]
Wang 2015	30	73.5 (7.2)	60	63 (11.9)		3.77%	0.98[0.52,1.45]
Yoon 2014	8	51.5 (18.3)	9	45.7 (21.4)		2.28%	0.28[-0.68,1.23]
Subtotal * **	**553**		**495**			**86.97%**	**0.46[0.23,0.69]**
Heterogeneity: Tau^2=0.26; Chi^2=88.6, df=30(P<0.0001); I^2=66.14%							
Test for overall effect: Z=3.95(P<0.0001)							
2.1.2 Mirror therapy for the lower extremity							
Cha 2015	19	56.7 (11)	17	53.1 (9.6)		3.13%	0.34[-0.32,1]
In 2016	13	49.1 (2.7)	12	46.1 (3)		2.58%	1.02[0.18,1.86]
Lee 2016	14	46.3 (4.2)	13	37.6 (13.9)		2.73%	0.84[0.04,1.63]

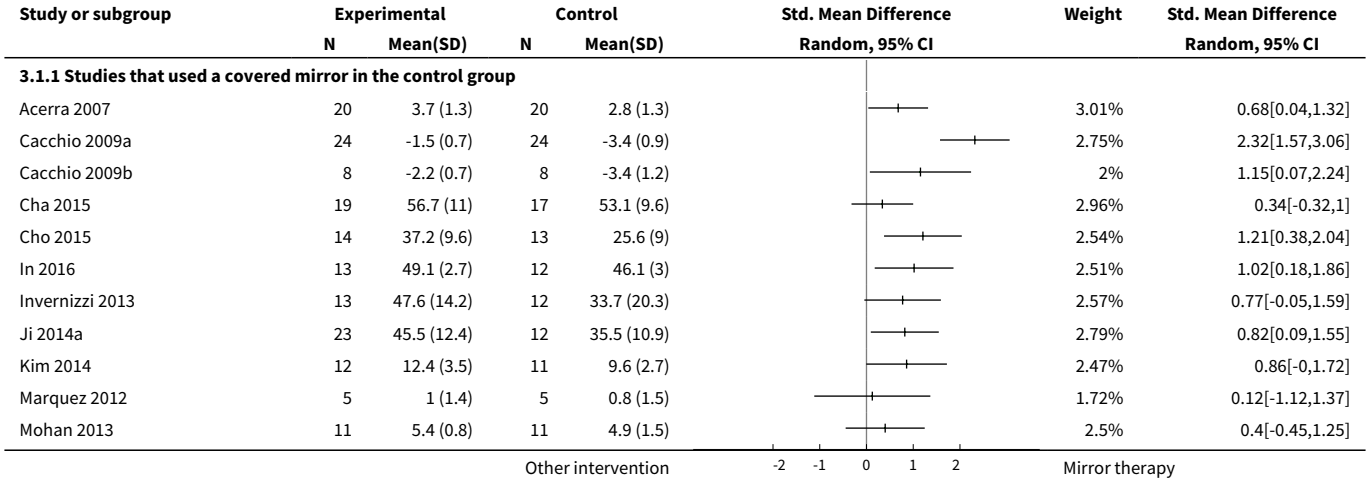




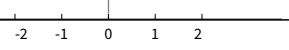
Comparison 3. Subgroup analysis: sham intervention (covered mirror) versus other intervention (unrestricted view)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Motor function at the end of intervention phase	36	1199	Std. Mean Difference (IV, Random, 95% CI)	0.50 [0.29, 0.72]
1.1 Studies that used a covered mirror in the control group	16	506	Std. Mean Difference (IV, Random, 95% CI)	0.67 [0.36, 0.99]
1.2 Studies that used unrestricted view in the control group	14	474	Std. Mean Difference (IV, Random, 95% CI)	0.27 [-0.05, 0.59]
1.3 Studies that used no additional control intervention	8	219	Std. Mean Difference (IV, Random, 95% CI)	0.57 [-0.02, 1.15]

Analysis 3.1. Comparison 3 Subgroup analysis: sham intervention (covered mirror) versus other intervention (unrestricted view), Outcome 1 Motor function at the end of intervention phase.



Study or subgroup	Experimental N	Experimental Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
Nagapattinam 2015	40	28.7 (11.5)	20	28.4 (9.1)		3.27%	0.03[-0.51,0.56]
Park 2015b	15	49.4 (16.9)	15	37.3 (11.4)		2.74%	0.82[0.07,1.57]
Piravej 2012	17	0.6 (0.9)	16	0.7 (0.7)		2.9%	-0.12[-0.8,0.56]
Rodrigues 2016	8	51 (16.2)	8	32.5 (29)		2.12%	0.74[-0.28,1.77]
Thieme 2013	39	3.1 (8.9)	21	3.1 (7.1)		3.29%	0[-0.53,0.53]
Subtotal ***	**281**		**225**			**42.13%**	**0.67[0.36,0.99]**
Heterogeneity: Tau²=0.25; Chi²=40.71, df=15(P=0); I²=63.16%							
Test for overall effect: Z=4.2(P<0.0001)							
3.1.2 Studies that used unrestricted view in the control group							
Alibakhshi 2016	12	7.6 (7.7)	12	0.8 (1.2)		2.42%	1.19[0.31,2.07]
Amasyali 2016	9	13.9 (11.2)	7	15.7 (12.1)		2.19%	-0.15[-1.14,0.84]
Bae 2012	10	17.1 (3)	10	14.2 (2.3)		2.28%	1.03[0.08,1.97]
Colomer 2016	15	10.1 (1.8)	16	12.6 (1.8)		2.63%	-1.35[-2.14,-0.56]
Dohle 2009	18	4.7 (12.5)	18	3.9 (7.9)		2.98%	0.07[-0.58,0.73]
In 2012	11	22.4 (4)	8	21 (5)		2.34%	0.3[-0.62,1.22]
Kim 2016	12	36.2 (3.4)	13	33.4 (3.1)		2.55%	0.83[0.01,1.66]
Lee 2016	14	46.3 (4.2)	13	37.6 (13.9)		2.63%	0.84[0.04,1.63]
Lin 2014a	28	17.1 (14.3)	14	19.9 (15.2)		3%	-0.19[-0.83,0.45]
Michielsen 2011	20	25.5 (17.4)	20	21.1 (16.8)		3.05%	0.25[-0.37,0.87]
Schick 2017	15	5.9 (9.2)	17	6.3 (9.7)		2.87%	-0.04[-0.74,0.65]
Tyson 2015	57	20 (23)	28	17 (21)		3.48%	0.13[-0.32,0.59]
Wang 2015	30	73.5 (7.2)	30	67.2 (8.4)		3.3%	0.8[0.27,1.32]
Yoon 2014	8	51.5 (18.3)	9	45.7 (21.4)		2.25%	0.28[-0.68,1.23]
Subtotal ***	**259**		**215**			**37.98%**	**0.27[-0.05,0.59]**
Heterogeneity: Tau²=0.22; Chi²=34.49, df=13(P=0); I²=62.31%							
Test for overall effect: Z=1.68(P=0.09)							
3.1.3 Studies that used no additional control intervention							
Amasyali 2016	9	13.9 (11.2)	8	16 (14.8)		2.26%	-0.15[-1.11,0.8]
Hiragami 2012	7	2.9 (1)	7	2.6 (1.9)		2.06%	0.18[-0.87,1.24]
Kim 2015a	20	13.6 (9.2)	9	12.6 (12.7)		2.64%	0.09[-0.69,0.88]
Kojima 2014	6	45.2 (13)	7	40.1 (19.3)		1.97%	0.28[-0.81,1.38]
Lee 2012	13	36.3 (6.3)	13	27.9 (7.8)		2.52%	1.15[0.31,1.99]
Samuelkamaleshkumar 2014	10	6.6 (8.4)	10	0.7 (2.2)		2.31%	0.92[-0.01,1.85]
Seok 2010	19	17.6 (10.5)	21	17.9 (8.9)		3.06%	-0.03[-0.65,0.59]
Wang 2015	30	73.5 (7.2)	30	58.7 (8.2)		3.07%	1.89[1.28,2.51]
Subtotal ***	**114**		**105**			**19.89%**	**0.57[-0.02,1.15]**
Heterogeneity: Tau²=0.52; Chi²=27.77, df=7(P=0); I²=74.8%							
Test for overall effect: Z=1.91(P=0.06)							
Total ***	**654**		**545**			**100%**	**0.5[0.29,0.72]**
Heterogeneity: Tau²=0.29; Chi²=111.07, df=37(P<0.0001); I²=66.69%							
Test for overall effect: Z=4.64(P<0.0001)							
Test for subgroup differences: Chi²=3.2, df=1 (P=0.2), I²=37.59%							



Other intervention

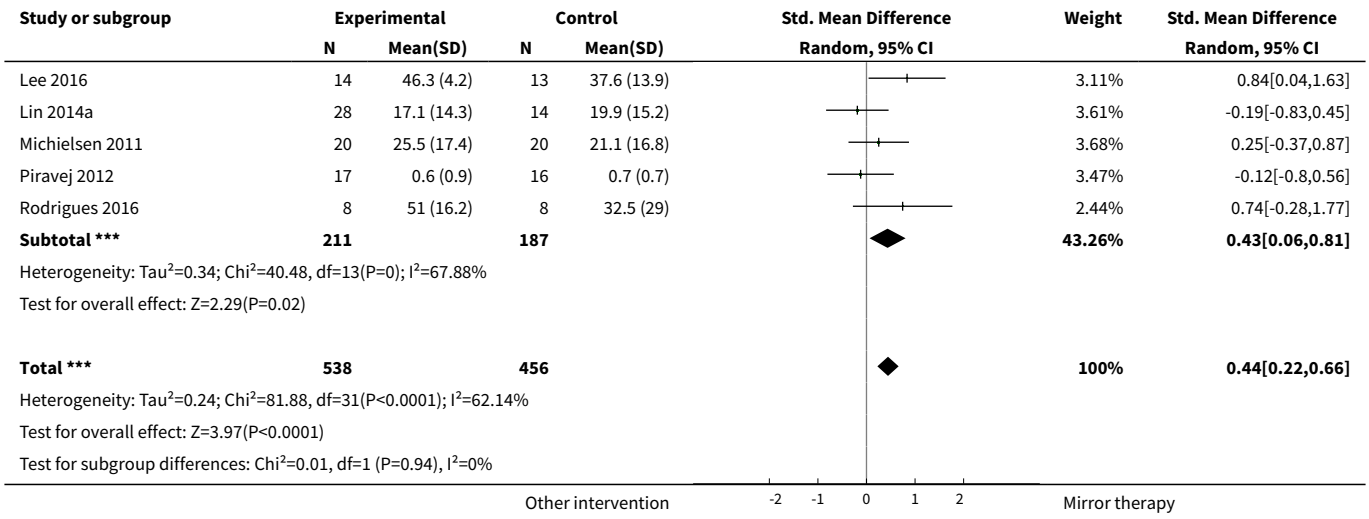
Mirror therapy

Comparison 4. Subgroup analysis: subacute versus chronic stage after stroke

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Motor function at the end of intervention phase	32	994	Std. Mean Difference (IV, Random, 95% CI)	0.44 [0.22, 0.66]
1.1 All studies including participants within 6 months after stroke	18	596	Std. Mean Difference (IV, Random, 95% CI)	0.45 [0.18, 0.73]
1.2 All studies including participants with more than 6 months after stroke	14	398	Std. Mean Difference (IV, Random, 95% CI)	0.43 [0.06, 0.81]

Analysis 4.1. Comparison 4 Subgroup analysis: subacute versus chronic stage after stroke, Outcome 1 Motor function at the end of intervention phase.

Study or subgroup	Experimental N	Experimental Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
4.1.1 All studies including participants within 6 months after stroke							
Acerra 2007	20	3.7 (1.3)	20	2.8 (1.3)		3.62%	0.68[0.04,1.32]
Bae 2012	10	17.1 (3)	10	14.2 (2.3)		2.64%	1.04[0.09,1.99]
Cacchio 2009a	24	-1.5 (0.7)	24	-3.4 (0.9)		3.26%	2.32[1.57,3.06]
Dohle 2009	18	4.7 (12.5)	18	3.9 (7.9)		3.57%	0.07[-0.58,0.73]
Hiragami 2012	7	2.9 (1)	7	2.6 (1.9)		2.37%	0.18[-0.87,1.24]
Invernizzi 2013	13	47.6 (15.2)	12	33.7 (20.3)		3.03%	0.75[-0.06,1.57]
Kim 2014	12	12.4 (3.5)	11	9.6 (2.7)		2.89%	0.86[-0,1.72]
Kojima 2014	6	45.2 (13)	7	40.1 (19.3)		2.26%	0.28[-0.81,1.38]
Lee 2012	13	11.4 (2.7)	13	9.3 (4)		3.12%	0.6[-0.19,1.38]
Marquez 2012	5	1 (1.4)	10	0.8 (1.4)		2.31%	0.13[-0.94,1.21]
Mohan 2013	11	5.4 (0.8)	11	4.9 (1.5)		2.94%	0.4[-0.45,1.25]
Nagapattinam 2015	40	28.7 (11.5)	20	28.4 (9.1)		3.99%	0.03[-0.51,0.56]
Samuelkamaleshkumar 2014	10	6.6 (8.4)	10	0.7 (2.2)		2.69%	0.92[-0.01,1.85]
Schick 2017	15	5.9 (9.2)	17	6.3 (9.7)		3.43%	-0.04[-0.74,0.65]
Seok 2010	19	17.6 (10.5)	21	17.9 (8.9)		3.69%	-0.03[-0.65,0.59]
Thieme 2013	39	3.1 (8.9)	21	3.1 (7.1)		4.01%	0[-0.53,0.53]
Tyson 2015	57	20 (23)	28	17 (21)		4.29%	0.13[-0.32,0.59]
Yoon 2014	8	51.5 (18.3)	9	45.7 (21.4)		2.61%	0.28[-0.68,1.23]
Subtotal ***	**327**		**269**			**56.74%**	**0.45[0.18,0.73]**
Heterogeneity: Tau^2=0.2; Chi^2=41.4, df=17(P=0); I^2=58.94%							
Test for overall effect: Z=3.23(P=0)							
4.1.2 All studies including participants with more than 6 months after stroke							
Alibakhshi 2016	12	7.6 (7.7)	12	0.8 (1.2)		2.83%	1.19[0.31,2.07]
Cacchio 2009b	8	-2.2 (0.7)	16	-3.7 (1.2)		2.65%	1.36[0.41,2.3]
Cha 2015	19	56.7 (11)	17	53.1 (9.6)		3.55%	0.34[-0.32,1]
Cho 2015	14	37.2 (9.6)	13	25.6 (9)		2.98%	1.21[0.38,2.04]
Colomer 2016	15	10.1 (1.8)	16	12.6 (1.8)		3.11%	-1.35[-2.14,-0.56]
In 2012	11	22.4 (4)	8	21 (5)		2.73%	0.3[-0.62,1.22]
In 2016	13	49.1 (2.7)	12	46.1 (3)		2.95%	1.02[0.18,1.86]
Kim 2015a	20	13.6 (9.2)	9	12.6 (12.8)		3.12%	0.09[-0.69,0.88]
Kim 2016	12	36.2 (3.4)	13	33.4 (3.1)		3.01%	0.83[0.01,1.66]
				Other intervention	-2 -1 0 1 2		Mirror therapy

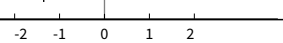


Comparison 5. Sensitivity analysis by trial methodology

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Motor function at the end of intervention	36		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
1.1 All studies without randomised cross-over trials	35	1160	Std. Mean Difference (IV, Random, 95% CI)	0.47 [0.27, 0.68]
1.2 All studies with adequate sequence generation	33	1005	Std. Mean Difference (IV, Random, 95% CI)	0.36 [0.19, 0.54]
1.3 All studies with adequate concealed allocation	16	572	Std. Mean Difference (IV, Random, 95% CI)	0.21 [-0.04, 0.47]
1.4 All studies with adequate handling of incomplete outcome data	12	388	Std. Mean Difference (IV, Random, 95% CI)	0.55 [0.14, 0.95]
1.5 All studies with blinded assessors	25	820	Std. Mean Difference (IV, Random, 95% CI)	0.44 [0.17, 0.70]
2 Motor impairment at the end of intervention	36		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
2.1 All studies with adequate sequence generation	36	1157	Std. Mean Difference (IV, Random, 95% CI)	0.46 [0.29, 0.63]

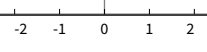
Analysis 5.1. Comparison 5 Sensitivity analysis by trial methodology, Outcome 1 Motor function at the end of intervention.

Study or subgroup	Experimental N	Experimental Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
5.1.1 All studies without randomised cross-over trials							
Acerra 2007	20	3.7 (1.3)	20	2.8 (1.3)		3.25%	0.68[0.04,1.32]
Alibakhshi 2016	12	7.6 (7.7)	12	0.8 (1.2)		2.54%	1.19[0.31,2.07]
Amasyali 2016	9	13.9 (11.2)	15	15.8 (13)		2.68%	-0.15[-0.98,0.68]
Bae 2012	10	17.1 (3)	10	14.2 (2.3)		2.37%	1.04[0.09,1.99]
Cacchio 2009a	24	-1.5 (0.7)	24	-3.4 (0.9)		2.93%	2.32[1.57,3.06]
Cacchio 2009b	8	-2.2 (0.7)	16	-3.7 (1.2)		2.37%	1.36[0.41,2.3]
Cha 2015	19	56.7 (11)	17	53.1 (9.6)		3.19%	0.34[-0.32,1]
Cho 2015	14	37.2 (9.6)	13	25.6 (9)		2.67%	1.21[0.38,2.04]
Colomer 2016	15	10.1 (1.8)	16	12.6 (1.8)		2.79%	-1.35[-2.14,-0.56]
Dohle 2009	18	4.7 (12.5)	18	3.9 (7.9)		3.21%	0.07[-0.58,0.73]
Hiragami 2012	7	2.9 (1)	7	2.6 (1.9)		2.12%	0.18[-0.87,1.24]
In 2012	11	22.4 (4)	8	21 (5)		2.44%	0.3[-0.62,1.22]
In 2016	13	49.1 (2.7)	12	46.1 (3)		2.64%	1.02[0.18,1.86]
Invernizzi 2013	13	47.6 (15.2)	12	33.7 (20.3)		2.71%	0.75[-0.06,1.57]
Ji 2014a	23	45.5 (12.4)	12	35.5 (10.9)		2.98%	0.82[0.09,1.55]
Kim 2014	12	12.4 (3.5)	11	9.6 (2.7)		2.59%	0.86[-0,1.72]
Kim 2015a	20	13.6 (9.2)	9	12.6 (12.8)		2.8%	0.09[-0.69,0.88]
Kim 2016	12	36.2 (3.4)	13	33.4 (3.1)		2.69%	0.83[0.01,1.66]
Lee 2012	13	11.4 (2.7)	13	9.3 (4)		2.8%	0.6[-0.19,1.38]
Lee 2016	14	46.3 (4.2)	13	37.6 (13.9)		2.78%	0.84[0.04,1.63]
Lin 2014a	28	17.1 (14.3)	14	19.9 (15.2)		3.24%	-0.19[-0.83,0.45]
Marquez 2012	5	1 (1.4)	10	0.8 (1.4)		2.07%	0.13[-0.94,1.21]
Michielsen 2011	20	25.5 (17.4)	20	21.1 (16.8)		3.31%	0.25[-0.37,0.87]
Mohan 2013	11	5.4 (0.8)	11	4.9 (1.5)		2.63%	0.4[-0.45,1.25]
Nagapattinam 2015	40	28.7 (11.5)	20	28.4 (9.1)		3.58%	0.03[-0.51,0.56]
Park 2015b	15	49.4 (16.9)	15	37.3 (11.4)		2.91%	0.82[0.07,1.57]
Piravej 2012	17	0.6 (0.9)	16	0.7 (0.7)		3.11%	-0.12[-0.8,0.56]
Rodrigues 2016	8	51 (16.2)	8	32.5 (29)		2.18%	0.74[-0.28,1.77]
Samuelkamaleshkumar 2014	10	6.6 (8.4)	10	0.7 (2.2)		2.4%	0.92[-0.01,1.85]
Schick 2017	15	5.9 (9.2)	17	6.3 (9.7)		3.08%	-0.04[-0.74,0.65]
Seok 2010	19	17.6 (10.5)	21	17.9 (8.9)		3.31%	-0.03[-0.65,0.59]
Thieme 2013	39	3.1 (8.9)	21	3.1 (7.1)		3.6%	0[-0.53,0.53]
Tyson 2015	57	20 (23)	28	17 (21)		3.85%	0.13[-0.32,0.59]
Wang 2015	30	73.5 (7.2)	60	63 (11.9)		3.82%	0.98[0.52,1.45]
Yoon 2014	8	51.5 (18.3)	9	45.7 (21.4)		2.34%	0.28[-0.68,1.23]
Subtotal ***	**609**		**551**			**100%**	**0.47[0.27,0.68]**
Heterogeneity: Tau^2=0.23; Chi^2=91.91, df=34(P<0.0001); I^2=63.01%							
Test for overall effect: Z=4.5(P<0.0001)							
5.1.2 All studies with adequate sequence generation							
Acerra 2007	20	3.7 (1.3)	20	2.8 (1.3)		3.71%	0.68[0.04,1.32]
Alibakhshi 2016	12	7.6 (7.7)	12	0.8 (1.2)		2.6%	1.19[0.31,2.07]
Amasyali 2016	9	13.9 (11.2)	15	15.8 (13)		2.81%	-0.15[-0.98,0.68]
Bae 2012	10	17.1 (3)	10	14.2 (2.3)		2.37%	1.04[0.09,1.99]
Cacchio 2009b	8	-2.2 (0.7)	16	-3.7 (1.2)		2.37%	1.36[0.41,2.3]
Cha 2015	19	56.7 (11)	17	53.1 (9.6)		3.6%	0.34[-0.32,1]
Cho 2015	14	37.2 (9.6)	13	25.6 (9)		2.8%	1.21[0.38,2.04]
Colomer 2016	15	10.1 (1.8)	16	12.6 (1.8)		2.97%	-1.35[-2.14,-0.56]



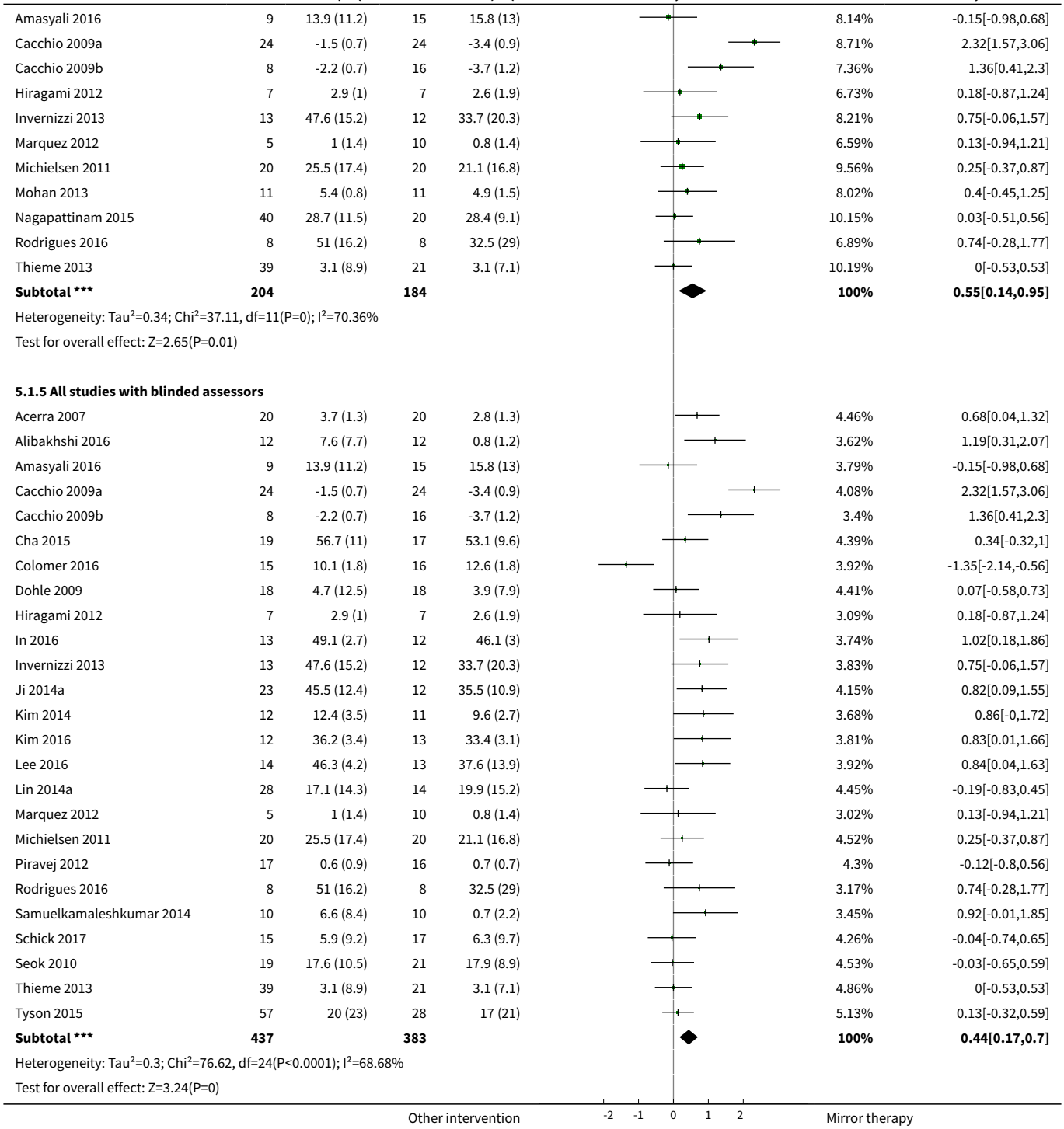
Other intervention — Mirror therapy

Study or subgroup	Experimental N	Experimental Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
Dohle 2009	18	4.7 (12.5)	18	3.9 (7.9)		3.64%	0.07[-0.58,0.73]
Hiragami 2012	7	2.9 (1)	7	2.6 (1.9)		2.06%	0.18[-0.87,1.24]
In 2012	11	22.4 (4)	8	21 (5)		2.47%	0.3[-0.62,1.22]
In 2016	13	49.1 (2.7)	12	46.1 (3)		2.75%	1.02[0.18,1.86]
Invernizzi 2013	13	47.6 (15.2)	12	33.7 (20.3)		2.86%	0.75[-0.06,1.57]
Ji 2014a	23	45.5 (12.4)	12	35.5 (10.9)		3.26%	0.82[0.09,1.55]
Kim 2014	12	12.4 (3.5)	11	9.6 (2.7)		2.67%	0.86[-0,1.72]
Kim 2015a	20	13.6 (9.2)	9	12.6 (12.8)		2.98%	0.09[-0.69,0.88]
Kim 2016	12	36.2 (3.4)	13	33.4 (3.1)		2.83%	0.83[0.01,1.66]
Kojima 2014	6	45.2 (13)	7	40.1 (19.3)		1.93%	0.28[-0.81,1.38]
Lee 2012	13	11.4 (2.7)	13	9.3 (4)		2.98%	0.6[-0.19,1.38]
Lee 2016	14	46.3 (4.2)	13	37.6 (13.9)		2.96%	0.84[0.04,1.63]
Lin 2014a	28	17.1 (14.3)	14	19.9 (15.2)		3.69%	-0.19[-0.83,0.45]
Marquez 2012	5	1 (1.4)	10	0.8 (1.4)		1.99%	0.13[-0.94,1.21]
Michielsen 2011	20	25.5 (17.4)	20	21.1 (16.8)		3.81%	0.25[-0.37,0.87]
Mohan 2013	11	5.4 (0.8)	11	4.9 (1.5)		2.74%	0.4[-0.45,1.25]
Nagapattinam 2015	40	28.7 (11.5)	20	28.4 (9.1)		4.32%	0.03[-0.51,0.56]
Piravej 2012	17	0.6 (0.9)	16	0.7 (0.7)		3.48%	-0.12[-0.8,0.56]
Rodrigues 2016	8	51 (16.2)	8	32.5 (29)		2.13%	0.74[-0.28,1.77]
Samuelkamaleshkumar 2014	10	6.6 (8.4)	10	0.7 (2.2)		2.42%	0.92[-0.01,1.85]
Schick 2017	15	5.9 (9.2)	17	6.3 (9.7)		3.42%	-0.04[-0.74,0.65]
Seok 2010	19	17.6 (10.5)	21	17.9 (8.9)		3.82%	-0.03[-0.65,0.59]
Thieme 2013	39	3.1 (8.9)	21	3.1 (7.1)		4.36%	0[-0.53,0.53]
Tyson 2015	57	20 (23)	28	17 (21)		4.86%	0.13[-0.32,0.59]
Yoon 2014	8	51.5 (18.3)	9	45.7 (21.4)		2.33%	0.28[-0.68,1.23]
Subtotal * **	**546**		**459**			**100%**	**0.36[0.19,0.54]**
Heterogeneity: Tau^2=0.12; Chi^2=58.03, df=32(P=0); I^2=44.86%							
Test for overall effect: Z=3.99(P<0.0001)							
5.1.3 All studies with adequate concealed allocation							
Acerra 2007	20	3.7 (1.3)	20	2.8 (1.3)		7.07%	0.68[0.04,1.32]
Cacchio 2009b	8	-2.2 (0.7)	16	-3.7 (1.2)		4.58%	1.36[0.41,2.3]
Cha 2015	19	56.7 (11)	17	53.1 (9.6)		6.87%	0.34[-0.32,1]
Colomer 2016	15	10.1 (1.8)	16	12.6 (1.8)		5.69%	-1.35[-2.14,-0.56]
Dohle 2009	18	4.7 (12.5)	18	3.9 (7.9)		6.93%	0.07[-0.58,0.73]
Hiragami 2012	7	2.9 (1)	7	2.6 (1.9)		3.99%	0.18[-0.87,1.24]
Invernizzi 2013	13	47.6 (15.2)	12	33.7 (20.3)		5.49%	0.75[-0.06,1.57]
Kim 2016	12	36.2 (3.4)	13	33.4 (3.1)		5.44%	0.83[0.01,1.66]
Marquez 2012	5	1 (1.4)	10	0.8 (1.4)		3.86%	0.13[-0.94,1.21]
Michielsen 2011	20	25.5 (17.4)	20	21.1 (16.8)		7.24%	0.25[-0.37,0.87]
Nagapattinam 2015	40	28.7 (11.5)	20	28.4 (9.1)		8.16%	0.03[-0.51,0.56]
Piravej 2012	17	0.6 (0.9)	16	0.7 (0.7)		6.64%	-0.12[-0.8,0.56]
Rodrigues 2016	8	51 (16.2)	8	32.5 (29)		4.13%	0.74[-0.28,1.77]
Schick 2017	15	5.9 (9.2)	17	6.3 (9.7)		6.54%	-0.04[-0.74,0.65]
Thieme 2013	39	3.1 (8.9)	21	3.1 (7.1)		8.23%	0[-0.53,0.53]
Tyson 2015	57	20 (23)	28	17 (21)		9.14%	0.13[-0.32,0.59]
Subtotal * **	**313**		**259**			**100%**	**0.21[-0.04,0.47]**
Heterogeneity: Tau^2=0.13; Chi^2=30.48, df=15(P=0.01); I^2=50.79%							
Test for overall effect: Z=1.66(P=0.1)							
5.1.4 All studies with adequate handling of incomplete outcome data							
Acerra 2007	20	3.7 (1.3)	20	2.8 (1.3)		9.44%	0.68[0.04,1.32]



Other intervention

Mirror therapy



Study or subgroup	Experimental N	Experimental Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
Amasyali 2016	9	13.9 (11.2)	15	15.8 (13)		8.14%	-0.15[-0.98,0.68]
Cacchio 2009a	24	-1.5 (0.7)	24	-3.4 (0.9)		8.71%	2.32[1.57,3.06]
Cacchio 2009b	8	-2.2 (0.7)	16	-3.7 (1.2)		7.36%	1.36[0.41,2.3]
Hiragami 2012	7	2.9 (1)	7	2.6 (1.9)		6.73%	0.18[-0.87,1.24]
Invernizzi 2013	13	47.6 (15.2)	12	33.7 (20.3)		8.21%	0.75[-0.06,1.57]
Marquez 2012	5	1 (1.4)	10	0.8 (1.4)		6.59%	0.13[-0.94,1.21]
Michielsen 2011	20	25.5 (17.4)	20	21.1 (16.8)		9.56%	0.25[-0.37,0.87]
Mohan 2013	11	5.4 (0.8)	11	4.9 (1.5)		8.02%	0.4[-0.45,1.25]
Nagapattinam 2015	40	28.7 (11.5)	20	28.4 (9.1)		10.15%	0.03[-0.51,0.56]
Rodrigues 2016	8	51 (16.2)	8	32.5 (29)		6.89%	0.74[-0.28,1.77]
Thieme 2013	39	3.1 (8.9)	21	3.1 (7.1)		10.19%	0[-0.53,0.53]
Subtotal * **	**204**		**184**			**100%**	**0.55[0.14,0.95]**
Heterogeneity: Tau^2=0.34; Chi^2=37.11, df=11(P=0); I^2=70.36%							
Test for overall effect: Z=2.65(P=0.01)							
5.1.5 All studies with blinded assessors							
Acerra 2007	20	3.7 (1.3)	20	2.8 (1.3)		4.46%	0.68[0.04,1.32]
Alibakhshi 2016	12	7.6 (7.7)	12	0.8 (1.2)		3.62%	1.19[0.31,2.07]
Amasyali 2016	9	13.9 (11.2)	15	15.8 (13)		3.79%	-0.15[-0.98,0.68]
Cacchio 2009a	24	-1.5 (0.7)	24	-3.4 (0.9)		4.08%	2.32[1.57,3.06]
Cacchio 2009b	8	-2.2 (0.7)	16	-3.7 (1.2)		3.4%	1.36[0.41,2.3]
Cha 2015	19	56.7 (11)	17	53.1 (9.6)		4.39%	0.34[-0.32,1]
Colomer 2016	15	10.1 (1.8)	16	12.6 (1.8)		3.92%	-1.35[-2.14,-0.56]
Dohle 2009	18	4.7 (12.5)	18	3.9 (7.9)		4.41%	0.07[-0.58,0.73]
Hiragami 2012	7	2.9 (1)	7	2.6 (1.9)		3.09%	0.18[-0.87,1.24]
In 2016	13	49.1 (2.7)	12	46.1 (3)		3.74%	1.02[0.18,1.86]
Invernizzi 2013	13	47.6 (15.2)	12	33.7 (20.3)		3.83%	0.75[-0.06,1.57]
Ji 2014a	23	45.5 (12.4)	12	35.5 (10.9)		4.15%	0.82[0.09,1.55]
Kim 2014	12	12.4 (3.5)	11	9.6 (2.7)		3.68%	0.86[-0,1.72]
Kim 2016	12	36.2 (3.4)	13	33.4 (3.1)		3.81%	0.83[0.01,1.66]
Lee 2016	14	46.3 (4.2)	13	37.6 (13.9)		3.92%	0.84[0.04,1.63]
Lin 2014a	28	17.1 (14.3)	14	19.9 (15.2)		4.45%	-0.19[-0.83,0.45]
Marquez 2012	5	1 (1.4)	10	0.8 (1.4)		3.02%	0.13[-0.94,1.21]
Michielsen 2011	20	25.5 (17.4)	20	21.1 (16.8)		4.52%	0.25[-0.37,0.87]
Piravej 2012	17	0.6 (0.9)	16	0.7 (0.7)		4.3%	-0.12[-0.8,0.56]
Rodrigues 2016	8	51 (16.2)	8	32.5 (29)		3.17%	0.74[-0.28,1.77]
Samuelkamaleshkumar 2014	10	6.6 (8.4)	10	0.7 (2.2)		3.45%	0.92[-0.01,1.85]
Schick 2017	15	5.9 (9.2)	17	6.3 (9.7)		4.26%	-0.04[-0.74,0.65]
Seok 2010	19	17.6 (10.5)	21	17.9 (8.9)		4.53%	-0.03[-0.65,0.59]
Thieme 2013	39	3.1 (8.9)	21	3.1 (7.1)		4.86%	0[-0.53,0.53]
Tyson 2015	57	20 (23)	28	17 (21)		5.13%	0.13[-0.32,0.59]
Subtotal * **	**437**		**383**			**100%**	**0.44[0.17,0.7]**
Heterogeneity: Tau^2=0.3; Chi^2=76.62, df=24(P<0.0001); I^2=68.68%							
Test for overall effect: Z=3.24(P=0)							

Analysis 5.2. Comparison 5 Sensitivity analysis by trial methodology, Outcome 2 Motor impairment at the end of intervention.

Study or subgroup	Favours [experimental] N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
5.2.1 All studies with adequate sequence generation							
Acerra 2007	20	13.7 (5.8)	20	9.6 (3.8)		3.27%	0.82[0.17,1.47]
Alibakhshi 2016	12	69 (7.4)	12	54.2 (9.6)		2.1%	1.67[0.72,2.62]
Amasyali 2016	9	48.7 (15.5)	15	48.3 (16.7)		2.51%	0.02[-0.8,0.85]
Arya 2015	17	30.4 (9.1)	16	23 (5.6)		2.92%	0.95[0.22,1.67]
Arya 2017	16	24.3 (8.1)	15	19 (7.6)		2.91%	0.66[-0.07,1.38]
Cho 2015	14	45.6 (8.8)	13	41.9 (15.8)		2.77%	0.28[-0.48,1.04]
Colomer 2016	15	8.6 (1.1)	16	9.5 (1.1)		2.87%	-0.8[-1.53,-0.06]
Dohle 2009	18	13.4 (3.2)	18	12.7 (3.3)		3.23%	0.21[-0.44,0.87]
Gurbuz 2016	16	27.1 (14.5)	15	17.3 (11.7)		2.89%	0.72[-0.01,1.45]
In 2012	11	59.5 (7.4)	8	49.6 (13)		2.05%	0.94[-0.03,1.91]
Invernizzi 2013	13	76 (21.8)	12	51.6 (24.7)		2.46%	1.02[0.17,1.86]
Ji 2014a	23	53.5 (9.6)	12	47.9 (8.5)		2.97%	0.59[-0.12,1.3]
Kim 2014	12	26.7 (8.7)	11	17.5 (5.7)		2.26%	1.19[0.29,2.1]
Kim 2016	12	36.9 (3.3)	13	33.6 (3.2)		2.47%	0.98[0.14,1.82]
Kojima 2014	6	46.2 (10.7)	7	35.6 (16.3)		1.64%	0.7[-0.43,1.84]
Kuzgun 2012	10	30.8 (21.7)	10	23.2 (15.7)		2.31%	0.38[-0.5,1.27]
Lee 2012	13	36.3 (6.3)	13	27.9 (7.8)		2.47%	1.15[0.31,1.99]
Lee 2016	14	6.6 (3.1)	13	4.1 (3)		2.66%	0.79[0.01,1.58]
Lim 2016	30	41.4 (9)	30	37.4 (9)		3.97%	0.44[-0.07,0.95]
Lin 2014a	28	50.4 (9.1)	15	47.1 (10.1)		3.34%	0.34[-0.29,0.97]
Marquez 2012	5	3.6 (5)	10	6.3 (4.5)		1.73%	-0.55[-1.64,0.55]
Michielsen 2011	20	43.5 (14)	20	36.6 (14.2)		3.35%	0.48[-0.15,1.11]
Mohan 2013	11	25.4 (2.3)	11	17.4 (5.5)		1.9%	1.83[0.8,2.85]
Piravej 2012	17	2.4 (0.8)	16	2.5 (0.8)		3.1%	-0.12[-0.81,0.56]
Rodrigues 2016	8	41.4 (8.1)	8	46.8 (9.6)		1.95%	-0.57[-1.58,0.43]
Samuelkamaleshkumar 2014	10	30.8 (23.9)	10	8.8 (13.9)		2.1%	1.08[0.13,2.03]
Schick 2017	15	29.7 (14.4)	17	26.9 (16.7)		3.04%	0.17[-0.52,0.87]
Seok 2010	19	28.2 (11.7)	21	26.3 (9.4)		3.39%	0.18[-0.45,0.8]
Sütbeyaz 2007	20	3.5 (0.8)	20	3 (0.7)		3.31%	0.65[0.01,1.29]
Tezuka 2006	9	11.9 (6.2)	6	6.3 (5.2)		1.72%	0.9[-0.2,2]
Thieme 2013	39	8.4 (11.3)	21	9.2 (10.6)		3.87%	-0.07[-0.6,0.46]
Tyson 2015	57	49 (32)	28	47 (28)		4.32%	0.06[-0.39,0.52]
Wu 2013	16	51.3 (8.1)	17	47.9 (9.8)		3.07%	0.37[-0.32,1.06]
Yavuzer 2008	17	3.6 (1.2)	19	2.8 (1)		3.13%	0.71[0.03,1.39]
Yoon 2014	8	47 (20)	9	53.3 (19.6)		2.08%	-0.3[-1.26,0.66]
Yun 2011	40	16 (11.3)	20	15.3 (6.9)		3.84%	0.07[-0.47,0.61]
Subtotal ***	**620**		**537**			**100%**	**0.46[0.29,0.63]**
Heterogeneity: Tau^2=0.12; Chi^2=65.67, df=35(P=0); I^2=46.7%							
Test for overall effect: Z=5.32(P<0.0001)							

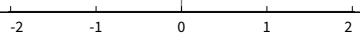
Other intervention Mirror therapy

Comparison 6. Post hoc sensitivity analysis removing studies that only included participants with CRPS after stroke. Subgroup analysis: pain without complex regional pain syndrome (CRPS)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Pain at the end of intervention	4	176	Std. Mean Difference (IV, Random, 95% CI)	-0.23 [-0.53, 0.08]

Analysis 6.1. Comparison 6 Post hoc sensitivity analysis removing studies that only included participants with CRPS after stroke. Subgroup analysis: pain without complex regional pain syndrome (CRPS), Outcome 1 Pain at the end of intervention.

Study or subgroup	Experimental N	Experimental Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
Acerra 2007	20	0.1 (0.3)	20	0.6 (1.4)		22.98%	-0.48[-1.11,0.15]
Dohle 2009	18	1.7 (0.2)	18	1.7 (0.2)		21.35%	0[-0.65,0.65]
Michielsen 2011	20	8.8 (10.8)	20	9.2 (14.1)		23.72%	-0.03[-0.65,0.59]
Thieme 2013	39	-19.6 (4.3)	21	-18.1 (4.5)		31.94%	-0.34[-0.87,0.2]
Total ***	**97**		**79**			**100%**	**-0.23[-0.53,0.08]**
Heterogeneity: Tau^2=0; Chi^2=1.66, df=3(P=0.65); I^2=0%							
Test for overall effect: Z=1.47(P=0.14)							



ADDITIONAL TABLES

Table 1. Characteristics of participants of included studies

Study ID	Mean age	Sex		Side of paresis		Time since stroke	Type of stroke	
	Years	Women	Men	Left	Right	Mean time	Ischaemic	Haemorrhagic
Acerra 2007	68	22	18	16	24	5.3 days	40	0
Alibakhshi 2016	50.9	9	15	15	9	n/r	n/r	n/r
Altschuler 1999	58.2	4	5	8	1	4.8 years	n/r	n/r
Amasyali 2016	58.8	11	13	8	16	5.3 months	24	0
Arya 2015	45.6	8	25	7	26	12.9 months/12.3 months.	17	16
Arya 2017	46.4	6	30	16	20	15.9 months	17	9
Bae 2012	53.9	7	13	13	7	4.6 months	9	11
Bahrami 2013	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r
Cacchio 2009a	58.4	26	22	34	14	5 months	35	13
Cacchio 2009b	62	13	11	15	9	15.7 months	19	5
Cha 2015	58.7	17	19	n/r	n/r	1.8 months	n/r	n/r
Cho 2015	59.3	12	15	14	13	13.2 months/15.5 months	17	10
Colomer 2016	53.5	5	26	24	7	551 days	23	8
Dalla Libera 2015	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r
Dohle 2009	56.5	10	26	25	11	27 days	48	0
Geller 2016	n/r	3	3	n/r	n/r	n/r	n/r	n/r
Gurbuz 2016	60.9	14	17	14	17	44.3 days	25	6
Hiragami 2012	67.5	6	8	6	8	47 days	9	5

Table 1. Characteristics of participants of included studies *(Continued)*

In 2012	63.9	8	11	9	10	14.1 months	10	9
In 2016	55.9	10	15	13	12	13.1 days	16	9
Invernizzi 2013	66.6	9	17	13	13	23 days	26	0
Ji 2014a	52.6	13	22	14	21	8.9 months	19	16
Kawakami 2015	64.1	24	43	35	32	32.3 days	28	39
Kim 2014	55.8	9	14	13	10	34.5 days	14	9
Kim 2015a	57.7	9	20	20	9	404.4 days	14	15
Kim 2016	49.1	9	16	16	9	n/r	8	17
Kojima 2014	69.1	3	10	5	8	78.8 days	10	3
Kumar 2013	57.3	8	22	n/r	n/r	n/r	n/r	n/r
Kuzgun 2012	61.4	10	10	10	10	n/r	n/r	n/r
Lee 2012	57.1	11	15	11	15	3.6 months	n/r	n/r
Lee 2016	54.7	13	14	8	19	39.6 months	8	20
Lim 2016	64.9	21	39	31	29	52 days	19	41
Lin 2014a	55	11	32	22	21	19.6 months	20	28
Manton 2002	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r
Marquez 2012	68.7	8	7	9	6	24.3 days	10	5
Michielsen 2011	57	20	20	28	12	4.6 years	28	12
Mirela 2015	57.5	8	7	5	10	53.2 days	15	0
Mohan 2013	63	10	12	6	16	6.4 days	14	8
Moustapha 2012	53.5	4	4	4	4	4.5 months	n/r	n/r

Table 1. Characteristics of participants of included studies *(Continued)*

Nagapattinam 2015	44.9	20	40	n/r	n/r	4.2 months	60	0
Pandian 2014	63.4	20	28	37	11	2 days	26	22
Park 2015a	56.3	13	17	14	16	20.9 months	16	14
Park 2015b	60	15	15	17	13	8.2 months	17	13
Piravej 2012	56	19	21	25	15	7.2 months	27	13
Rajappan 2016	58	9	21	3	27	5 months	20	10
Rehani 2015	56.3	n/r	n/r	n/r	n/r	83.9 days	n/r	n/r
Rodrigues 2016	57.5	6	10	11	5	34.8 months	16	0
Rothgangel 2004	73.4	10	6	8	8	9.5 months	16	0
Salhab 2016	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r
Samuelkamaleshkumar 2014	51.2	4	16	9	11	4.1weeks	14	6
Schick 2017	63	13	19	15	17	50 days	27	5
Seok 2010	51.4	22	18	n/r	n/r	4.0 months	n/r	n/r
Sütbeyaz 2007	63.4	17	23	27	13	3.7 months	33	7
Tezuka 2006	63.7	9	6	6	9	32.7 days	n/r	n/r
Thieme 2013	67.2	25	35	37	23	45 days	45	15
Tyson 2015	64	34	60	56	38	29 days	76	18
Wang 2015	64.9	40	50	39	51	63.7 days	57	33
Wu 2013	54.2	10	23	18	15	20.6 months	20	13
Yavuzer 2008	63.3	17	19	21	19	5.5 months	29	7
Yoon 2014	57.8	10	16	15	11	22.7 days	16	10

Table 1. Characteristics of participants of included studies *(Continued)*

Yun 2011	63.3	21	39	31	29	25.8 days	46	14
Zacharis 2014	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r

n/r: not reported

Table 2. Characteristics of interventions of included studies

Study ID	Extremity	Mirror therapy variation	Control intervention	Type of movements	Minutes per session	Sessions per week	Total duration (weeks)	Total amount of therapy (minutes)	Setting
Acerra 2007	Upper extremity	Bilateral activities	Bilateral activities; covered mirror	Functional motor tasks (i.e. with objects); motor co-ordination tasks; sensory discrimination tasks; grip strength; active range of motion	20 to 30	7	2	280 - 420	Inpatient hospital
Al-ibakhshi 2016	Upper extremity	Bilateral activities	Bilateral activities without mirror	n/r	30	5	3	450	Inpatient hospital
Altschuler 1999	Upper extremity	Bilateral activities	Bilateral activities; transparent plastic between limbs	Proximal and distal movements	15 (2 times a day)	12	4 (1st period)	720	n/r
Amasyali 2016	Upper extremity	Activities of the unaffected limb	1. EMG-triggered electrostimulation; 2. control group: no additional therapy	Wrist, hand flexion, extension and forearm circumduction, and supination–pronation	30	5	3	450	Inpatient rehabilitation centre
Arya 2015	Upper extremity	Activities of the unaffected limb	Conventional therapy based on Brunnstrom and Bobath principles	Task-based mirror therapy: finger dexterity, mass grasp/finger flexion, release/finger extension, wrist dorsiflexion, and forearm supination by using objects and practising tasks	45	5	8	1800	Inpatient hospital, home after discharge

Table 2. Characteristics of interventions of included studies *(Continued)*

Arya 2017	Lower extremity	Activities of the unaffected limb	Conventional motor therapy based on neurophysiological approaches	Activity-based MT: ball-rolling, rocker-board and pedaling	60	n/r	3 - 4 (30 session)	1800	Inpatient rehabilitation centre
Bae 2012	Upper extremity	Bilateral activities	Activities of the non-paretic arm, without mirror	Flexion/extension of the shoulder, radial/ulnar deviation and pro-/supination of the forearm, flexion/extension of the fingers	30	5	4	600	Inpatient rehabilitation centre
Bahrami 2013	Upper and lower extremity	Activities of the unaffected limbs	Routine programme (physiotherapy and neuromuscular stimulation)	Range of motion of the healthy limbs	30	5	4	600	n/r
Cacchio 2009a	Upper extremity	Activities of the unaffected limb	Activities of the unaffected limb; covered mirror	Flexion/extension of shoulder, elbow and wrist; prone/supination forearm	30 1st 2 weeks; 60 last 2 weeks	5	4	900	Inpatient and outpatient rehabilitation centre
Cacchio 2009b	Upper extremity	Activities of the unaffected limb	Activities of the unaffected limb; covered mirror (control group 1); imagination of movements of the affected limb (control group 2)	Flexion/extension of shoulder, elbow and wrist; prone/supination forearm	30	Daily	4	840	Inpatient and outpatient rehabilitation centre
Cha 2015	Lower extremity	Activities of the unaffected limb + rTMS	Activities of the unaffected limb; covered mirror + rTMS	Flexing and extending the hip, knee, and ankle at a self-selected speed under supervision but without additional verbal feedback	20	5	4	400	n/r

Table 2. Characteristics of interventions of included studies *(Continued)*

Cho 2015	Upper extremity	Activities of the unaffected limb + tDCS /anode attached over primary motor cortex	Activities of the unaffected limb; covered mirror + tDCS	Pronation, supination, flexion, and extension of both wrists, flexion and extension of the fingers, and flexion and extension of the elbows (10 sets, 20 repetitions per motion and set, 2 min rest between sets)	20	3	6	360	n/r
Colomer 2016	Upper extremity	Activities of the unaffected limb	Passive mobilisation of the affected limb	Flexion and extension of shoulder, pronation and supination of forearm, gross and fine motor movements of wrist, hand and fingers (also with objects)	45	3	8	1080	Outpatient rehabilitation centre
Dalla Libera 2015	Upper extremity	10 Hz TMS applied by 8-coil on the ipsilesional somatosensory cortex, followed by MT	TMS only	n/r	30	3	4	360	n/r
Dohle 2009	Upper extremity	Bilateral activities	Bilateral activities; without mirror	Execution of arm, hand and finger postures	30	5	6	900	Inpatient rehabilitation centre
Geller 2016	Upper extremity	Bilateral and unilateral activities	Traditional occupational therapy	n/r	30	5	6	900	Home setting
Gurbuz 2016	Upper extremity	Activities of the unaffected limb	Movements of the unaffected limb; covered mirror	Flexion and extension of wrist and finger	20	5	4	400	Inpatient rehabilitation centre
Hiragami 2012	Upper extremity	Bilateral activities	No additional therapy	Supination and eversion of the forearm, flexion and extension of the wrist and finger, grasp a block	30	6 or 7	4	720 - 840	Inpatient Hospital
In 2012	Upper extremity	Bilateral activities; virtual mirror on a screen; arm	Bilateral activities; without mirror (screen was off)	1st week: wrist flexion/ extension, forearm pro-/supination, clenching and opening the hand, 2nd week gross motor tasks, 3rd and 4th week fine motor tasks; 3 sets of 10 repeti-	30	5	4	600	Inpatient rehabilitation centre

Table 2. Characteristics of interventions of included studies *(Continued)*

		projected by a camera		tions, comfortable speed of movement, supervision of caregivers, using checklist					
In 2016	Lower extremity	Uni- and bilateral activities; virtual mirror on the screen, leg projected by a camera	Uni- and bilateral activities; without mirror (screen was off)	1st week: dorsiflexion and plantarflexion (lifting of the heel) of the unaffected ankle; adduction and abduction of forefoot and rear foot; and adduction and abduction of the hip (moving the knees inward and outward), 2nd week mimicked the movements (1st week) of the unaffected lower limb on the monitor with the affected lower limb, 3rd dorsiflexion, adduction and abduction of the unaffected ankle; plantar flexion, adduction and abduction of the ankle; and adduction and abduction of the hip; 4th week: complex movements and different tasks (remote control with up and down buttons); 3 sets of 10 repetitions, comfortable speed of movement, supervision of caregivers, using checklist	30	5	5	600	Inpatient rehabilitation centre
Invernizzi 2013	Upper extremity	Movements of the unaffected limb	Movements of the unaffected limb; covered mirror	Flexion/extension of shoulder, elbow and wrist, pro- /supination of the forearm, self selected speed, no additional verbal feedback	30 1st 2 weeks; 60 last 2 weeks	5	4	900	Inpatient rehabilitation centre
Ji 2014a	Upper extremity	Experimental 1: MT: Movements of the unaffected limb + rTMS; Experimental 2: MT: Movements of the unaffected limb	Activities of the unaffected limb, covered mirror	Experimental 1: finger flexion and extension + 10Hz rTMS on lesioned hemisphere; Experimental 2: finger flexion and extension	15	5	6	450	University hospital
Kawakami 2015	Lower extremity	Bilateral activities and activities of	4 control groups: (1) EMG triggered electrical muscle	Dorsiflexion of the ankle joint, stepping over, and abduction/adduction of the hip joint)	20	7	4	560	Inpatient rehabilitation centre

Table 2. Characteristics of interventions of included studies *(Continued)*

		the unaffected limb	stimulation; (2) electrical muscle stimulation; (3) repetitive facilitation exercises; (4) passive and active-assistive range of motion exercises						
Kim 2014	Upper extremity	Bilateral activities + FES	Bilateral activities + FES; covered mirror	Extension of wrist and fingers to lift of the hand from an FES switch, at the same time attempt to extend affected hand supported by electrical stimulation (20 Hz), pulse rate 300 µs, individual intensity for muscle contraction and complete extension	30	5	4	600	University hospital
Kim 2015a	Upper extremity	Bilateral activities + FES	No additional therapy	2 experimental groups: (1) EMG-triggered FES (due to unaffected limb) of affected wrist extension + physiological and object-related movements; (2) FES of affected wrist extension + physiological and object-related movements	30	5	4	600	Inpatient rehabilitation centre
Kim 2016	Upper extremity	Activities of the unaffected limb	Conventional therapy	Arm bicycling, peg board exercise, skateboard-supported exercises on a tabletop, donut on base putty kneading, double curved arch, bimanual placing cone, block stacking, graded pinch exercise, plastic cone stacking, shoulder curved arch	30	5	4	300	Outpatient hospital
Kojima 2014	Upper extremity	Bilateral activities + EMTS	No additional therapy	Extension of wrist and fingers to reach EMG threshold on 50 - 70% of maximum wrist extension, neuromuscular stimulation 10 seconds symmetrical biphasic pulses at 50 Hz, pulse width 200 µs, followed by 20 seconds of rest to assist full range of motion; bimanual wrist and finger extension during 'on' and 'off' period, difficulty of exercises dependent	20 (2 times a day)	5	4	800	Inpatient rehabilitation centre

Table 2. Characteristics of interventions of included studies *(Continued)*

				upon participants' levels of functioning with regard to wrist and finger flexion and extension or thumb opposition					
Kumar 2013	Lower extremity	Activities of the unaffected limb	No additional therapy	Flexion/ extension of the knee and ankle; self-selected speed; under supervision	2 times daily for 15 minutes	5	2	300	n/r
Kuzgun 2012	Upper extremity	n/r	No additional therapy	Wrist extension	4 times daily for 15 minutes	5	4	1200	n/r
Lee 2012	Upper extremity	Bilateral activities	No additional therapy	Lifting both arms, flexion/ extension of the elbow, pronation of the forearm, wrist extension, internal/ external rotation of the wrist, clenching and opening the fist, tapping on the table; self-performed; supervision of a guardian	2 times daily for 25 minutes	5	4	1000	Inpatient rehabilitation ward
Lee 2016	Lower extremity	Bilateral activities + NMES	Conventional therapy	Dorsiflexion movements of the ankle	n/r	5	4	n/r	Rehabilitation hospital
Lim 2016	Upper extremity	Bilateral activities	Bilateral activities, covered mirror	Task-oriented MT: forearm pronation-supination and wrist flexion/extension, finger flexion-extension, counting numbers, tapping, and opposing; simple manipulating tasks (such as picking up coins and beans, flipping over cards); complicated tasks (plugging and unplugging pegboards, drawing simple figures, and colouring)	20	5	4	400	Inpatient rehabilitation ward
Lin 2014a	Upper extremity	Experimental 1: MT: Bilateral activities; Experimental 2: MT and sensory electrical stimulation	Task-oriented training	Transitive movements (e.g. gross motor tasks, such as reaching out to put a cup on a shelf, or fine motor tasks, such as picking up marbles); intransitive movements (e.g. gross motor movements, such as pronation and supination, or fine motor	60	5	4	1200	In- and outpatient setting

Table 2. Characteristics of interventions of included studies *(Continued)*

		by a mesh-glove		movements, such as finger opposition)					
Manton 2002	Upper extremity	n/r	n/r; transparent plastic between limbs	n/r	n/r	n/r	4	n/r	Home
Marquez 2012	Lower extremity	Bilateral activities	1: Bilateral activities, covered mirror; 2: Routine therapy	Alternate dorsiflexion and plantarflexion in both ankles as best as possible, self-paced speed	15	5	3	225	Inpatient rehabilitation unit
Michielsen 2011	Upper extremity	Bilateral activities	Bilateral activities	Exercises based on the Brunnstrom phases of motor recovery; functional tasks (i.e. with objects)	60	1 (under supervision) + 5 (at home)	6	2160	Home
Mirela 2015	Upper extremity	Bilateral activities	No additional therapy	Flexion and extension of shoulder, elbow, wrist and finger, pronesupination of the forearm	30	5	6	900	Inpatient
Mohan 2013	Lower extremity	Activities of the unaffected limb	Activities of the unaffected limb, non-reflecting surface	Lying position: hip-knee-ankle flexion, with the hip and knee placed in flexion, moving the knee inward and outward, hip abduction with external rotation followed by hip adduction with internal rotation; sitting position: Hip-knee-ankle flexion, knee extension with ankle dorsiflexion, knee flexion beyond 90 °; each exercise 2 sets of 10 repetitions	60	6	2	720	Inpatient rehabilitation
Moustapha 2012	Upper extremity	Bilateral activities	Landscape images were shown to participants, they should try to describe the images, without movements	Finger and hand movements	30	5	1	150	n/r
Nagappattinam 2015	Upper extremity	Bilateral activities	functional electrical stimula-	Experimental 1: wrist and finger extension, grasping and releasing a	30	6	2	360	Hospital

Table 2. Characteristics of interventions of included studies *(Continued)*

			tion, covered mirror	bottle; Experimental 2: combined MT and functional electrical stimulation					
Pandian 2014	Upper extremity	Bilateral activities, therapist supported if patients were not able to move paretic limb	Bilateral activities, covered mirror	Flexion and extension movements of wrist and fingers	60	5	4	1200	inpatient rehabilitation and home training after discharge
Park 2015a	Upper extremity	Activities of the unaffected limb	Activities of the unaffected limb; covered mirror	Pronation and supination of the forearm and the flexion and extension movements of the wrist and fingers; 5 sets each motion, 30 repetitions per set	30	5	4	600	Inpatient
Park 2015b	Upper extremity	Activities of the unaffected limb	Activities of the unaffected limb, non-reflecting surface	Task-oriented activities consisted with reaching, grasping, lifting and releasing objects	n/r	5	6	n/r	Rehabilitation unit
Piravej 2012	Upper extremity	Not stated	Same tasks; covered mirror	Task-oriented activities consisting of grasping and releasing objects	30	5	2	300	Inpatient rehabilitation centre
Rajappan 2016	Upper extremity	bilateral activities	Same tasks; covered mirror	Finger and wrist movements, grasping different objects	30	5	4	600	Nursing homes
Rehani 2015	Upper extremity	Bilateral activities	Motor relearning programme	Hand-opening, wrist flexion/ extension, forearm pronation/ supination, hand sliding on surface	n/r	6	4	n/r	Outpatient
Rodrigues 2016	Upper extremity	Bilateral activities	Bilateral activities; covered mirror	Task-orientend activities consisted with manipulating objects	60	3	4	720	Home
Rothgangel 2004a	Upper extremity	Bilateral activities (hypotone muscles); unilateral activities	Bilateral activities; without mirror	Gross motor arm and hand movements; functional activities (i.e. with objects); fine motor activities (i.e. with objects)	30	Total number of sessions: 17	5	510	Outpatient centre

Table 2. Characteristics of interventions of included studies *(Continued)*

		(hypertone muscles)							
Rothgangel 2004b	See Rothgangel 2004a	See Rothgangel 2004a	See Rothgangel 2004a	See Rothgangel 2004a	30	Total number of sessions: 37	5	1110	Inpatient rehabilitation centre
Salhab 2016	Lower extremity	MT + Electrical stimulation	Conventional therapy	n/r	50	4	2	400	n/r
Samuelka-maleshkumar 2014	Upper extremity	Activities of the unaffected limb	No additional therapy	Wrist flexion, extension, radial and ulnar deviation, circumduction, fisting, releasing, abduction, and adduction of all fingers; activities such as squeezing a ball, stacking rings, flipping cards, placing pegs on a board	2 times for 30	5	3	900	Inpatient rehabilitation centre
Schick 2017	Upper extremity	Bilateral activities	Electromyographic-triggered muscular electrical stimulation	Grasping movements in combination with electromyographic-triggered muscular electrical stimulation	30	5	3	450	3 inpatient rehabilitation centres
Seok 2010	Upper extremity	Activities of the unaffected limb	No therapy	5 movements of wrist and fingers, each 6 minutes	30	5	4	500	Inpatient rehabilitation centre
Sütbeyaz 2007	Lower extremity	Activities of the unaffected limb	Activities of the unaffected limb; covered mirror	Dorsiflexion movements of the ankle	30	5	4	600	Inpatient rehabilitation centre
Tezuka 2006	Upper extremity	Activities of the unaffected limb; affected limb passively moved by therapist	Activities of the unaffected limb; affected limb passively moved by therapist; without mirror	13 kinds of movements, i.e. flexion/extension of wrist, pinching fingers, gripping ball	10 to 15	Daily	4 (1st period)	280 to 420	Inpatient rehabilitation centre
Thieme 2013	Upper extremity	Bilateral activities	Bilateral activities; covered mirror	1st week: isolated movements of fingers, wrist, lower arm, elbow and shoulder in all degrees of freedom,	30	3 - 5	4 - 5	600	Inpatient rehabilitation centre

Table 2. Characteristics of interventions of included studies *(Continued)*

				up to 50 repetitions per series, up to 4 series; 2nd to 5th week: additional movements, object-related movements; adapted by therapists according to patients' abilities; Experimental 1 and control in group setting 2 - 6 participants					
Tyson 2015	Upper extremity	Not stated; self-performed, daily checking by therapist	Lower limb activities; without a mirror	n/r	30	5	4	600	12 inpatient stroke services
Wang 2015	Upper extremity	n/r	1: no additional therapy; 2: electromyographic biofeedback	n/r	n/r	n/r	n/r	n/r	n/r
Wu 2013	Upper extremity	Bilateral activities	Usual occupational therapy	Transitive movements: fine motor tasks of squeezing sponges, placing pegs in holes, flipping a card, gross motor tasks (reaching out for touch); intransitive movements (repetitive wrist flexion/extension, finger opposition, forearm pro-/supination)	60	5	4	1200	4 hospitals
Yavuzer 2008	Upper extremity	Bilateral activities	Bilateral activities; nonreflecting side of the mirror	Flexion/extension of wrist and fingers	30	5	4	600	Inpatient rehabilitation centre
Yoon 2014	Upper extremity	Activities of the unaffected limb	1: constraint induced movement therapy (6 hours/day) + palliative rehabilitation programme + self-exercise; 2: palliative rehabilitation	Flexion/extension of the shoulder, elbow, wrist, finger, and pronation/supination of the forearm	30	5	2	300	Inpatient rehabilitation centre

Table 2. Characteristics of interventions of included studies *(Continued)*

			programme + self-exercise						
Yun 2011	Upper extremity	Experimental 1: activities of the unaffected limb Experimental 2: activities of the unaffected limb and additionally neuromuscular electrical stimulation of the affected arm	Neuromuscular electrical stimulation of finger and wrist extensors of the affected arm	Flexion/extension of wrist and fingers	30	5	3	450	Inpatient rehabilitation centre
Zacharis 2014	n/r	n/r	n/r	n/r	30	Total: 20 - 24	8	600 - 720	n/r

EMG: electromyography
ETMS: electromyography-triggered neuromuscular stimulation
FES: functional electrical stimulation
Hz: hertz
MT: mirror therapy
NMES: neuromuscular electrical stimulation
n/r: not reported
rTMS: repetitive transcranial magnetic stimulation
tDCS: transcranial direct current stimulation
TMS: transcranial magnetic stimulation
µs: microsiemens

APPENDICES

Appendix 1. MEDLINE search strategy

MEDLINE Ovid

1. cerebrovascular disorders/ or exp basal ganglia cerebrovascular disease/ or exp brain ischemia/ or exp carotid artery diseases/ or exp intracranial arterial diseases/ or exp intracranial arteriovenous malformations/ or exp "intracranial embolism and thrombosis"/ or exp intracranial hemorrhages/ or stroke/ or exp brain infarction/
2. brain injuries/ or brain injury, chronic/
3. (stroke$ or cva or poststroke or post-stroke).tw.
4. (cerebrovasc$ or cerebral vascular).tw.
5. (cerebral or cerebellar or brain$ or vertebrobasilar).tw.
6. (infarct$ or isch?emi$ or thrombo$ or emboli$ or apoplexy).tw.
7. 5 and 6
8. (cerebral or brain or subarachnoid).tw.
9. (haemorrhage or hemorrhage or haematoma or hematoma or bleed$).tw.
10. 8 and 9
11. exp hemiplegia/ or exp paresis/
12. (hempar$ or paretic or paresis or hemipleg$ or brain injur$).tw.
13. Gait Disorders, Neurologic/
14. 1 or 2 or 3 or 4 or 7 or 10 or 11 or 12 or 13
15. exp Upper Extremity/
16. (upper limb$ or upper extremit$ or arm or shoulder or hand or axilla or elbow$ or forearm$ or finger$ or wrist$).tw.
17. exp Lower Extremity/
18. (lower limb$ or lower extremit$ or buttock$ or foot or feet or hip or hips or knee or knees or leg or legs or thigh$ or ankle$ or heel $ or toe or toes).tw.
19. 15 or 16 or 17 or 18
20. Illusions/
21. (mirror$ or visual$ or virtual$).tw.
22. (visual adj5 (reflection or illusion or feedback or therapy)).tw.
23. ((limb$ or arm or leg) adj5 (reflect or reflection or illusion)).tw.
24. 20 or 21 or 22 or 23
25. 14 and 19 and 24

Appendix 2. Adapted search strategies for other electronical databases

CENTRAL

#1 [mh ^"cerebrovascular disorders"] or [mh "basal ganglia cerebrovascular disease"] or [mh "brain ischemia"] or [mh "carotid artery diseases"] or [mh "intracranial arterial diseases"] or [mh "intracranial arteriovenous malformations"] or [mh "intracranial embolism and thrombosis"] or [mh "intracranial hemorrhages"] or [mh ^stroke] or [mh "brain infarction"] or [mh ^"stroke, lacunar"] or [mh ^"vasospasm, intracranial"] or [mh ^"vertebral artery dissection"] or [mh ^"brain injuries"] or [mh ^"brain injury, chronic"]

#2 (stroke or poststroke or post-stroke or cerebrovasc* or brain next vasc* or cerebral next vasc* or cva* or apoplex* or SAH):ti,ab,kw (Word variations have been searched)

#3 ((brain* or cerebr* or cerebell* or intracran* or intracerebral) near/5 (isch*emi* or infarct* or thrombo* or emboli* or occlus*)):ti,ab,kw (Word variations have been searched)

#4 ((brain* or cerebr* or cerebell* or intracerebral or intracranial or subarachnoid) near/5 (haemorrhage* or hemorrhage* or haematoma* or hematoma* or bleed*)):ti,ab,kw (Word variations have been searched)

#5 [mh ^hemiplegia] or [mh paresis] or [mh "gait disorders, neurologic"]

#6 (hempar* or hemipleg* or brain next injur*):ti,ab,kw (Word variations have been searched)

#7 {or #1-#6}

#8 [mh "upper extremity"]

#9 (upper limb* or upper extremit* or arm or shoulder or hand or axilla or elbow* or forearm* or finger* or wrist*):ti,ab,kw (Word variations have been searched)

#10 [mh "lower extremity"]

#11 (lower limb* or lower extremit* or buttock* or foot or feet or hip or hips or knee or knees or leg or legs or thigh* or ankle* or heel* or toe or toes):ti,ab,kw (Word variations have been searched)

#12 {or #8-#11}

#13 [mh illusions]

#14 (mirror* or visual* or virtual*):ti,ab,kw (Word variations have been searched)

#15 ((limb* or arm or leg) near/5 (mirror* or reflect* or reflection or illusion or visual* or virtual*)):ti,ab,kw (Word variations have been searched)

#16 {or #13-#15}

#17 #7 and #12 and #16

Embase Ovid

1. cerebrovascular disease/ or brain disease/ or exp basal ganglion hemorrhage/ or exp brain hemangioma/ or exp brain hematoma/ or exp brain hemorrhage/ or exp brain infarction/ or exp brain ischemia/ or exp carotid artery disease/ or exp cerebral artery disease/ or exp cerebrovascular accident/ or exp cerebrovascular malformation/ or exp intracranial aneurysm/ or exp occlusive cerebrovascular disease/ or exp vertebrobasilar insufficiency/

2. (stroke$ or poststroke or apoplex$ or cerebral vasc$ or brain vasc$ or cerebrovasc$ or cva$ or SAH).tw.

3. ((brain or cerebr$ or cerebell$ or vertebrobasil$ or hemispher$ or intracran$ or intracerebral or infratentorial or supratentorial or middle cerebral artery or MCA$ or anterior circulation or posterior circulation or basilar artery or vertebral artery or space-occupying) adj5 (isch? emi$ or infarct$ or thrombo$ or emboli$ or occlus$ or hypoxi$)).tw.

4. ((brain$ or cerebr$ or cerebell$ or intracerebral or intracran$ or parenchymal or intraparenchymal or intraventricular or infratentorial or supratentorial or basal gangli$ or putaminal or putamen or posterior fossa or hemispher$ or subarachnoid) adj5 (h?emorrhag$ or h? ematoma$ or bleed$)).tw.

5. exp hemiplegia/ or exp paresis/ or neurologic gait disorder/

6. (hemipleg$ or hemipar$ or paresis or paraparesis or paretic).tw.

7. or/1-6

8. exp arm/ or limb/

9. (upper limb$ or upper extremit$ or arm or shoulder or hand or axilla or elbow$ or forearm$ or finger$ or wrist$).tw.

10. exp leg/

11. (lower lib$ or lower extremit$ or buttock$ or foot or feet or hip or hips or knee or knees or leg or legs or thigh$ or ankle$ or heel$ or toe or toes).tw.

12. or/8-11

13. exp illusion/

14. (mirror$ or visual$ or virtual$).tw.

15. ((limb$ or arm or leg) adj5 (mirror$ or reflect$ or reflection or illusion or visual$ or virtual$)).tw.

16. or/13-15

17. 7 and 12 and 16

18. limit 17 to yr="2011 -Current"

CINAHL Ebsco

1. (MH "Cerebrovascular Disorders+") or (MH "stroke patients") or (MH "stroke units")

2. TI (stroke or poststroke or post-stroke or cerebrovasc* or cerebral vasc or cva) or AB (stroke or poststroke or post-stroke or cerebrovasc* or cerebral vasc or cva)
3. TI (brain* or cerebr* or cerebell* or vertebrobasilar) or AB (brain* or cerebr* or cerebell* or vertebrobasilar)
4. TI (ischemi* or ischaemi* or infarct* or thrombo* or emboli* or apoplexy*) or AB (ischemi* or ischaemi* or infarct* or thrombo* or emboli* or apoplexy*)
5. 3 and 4
6. TI (brain* or cerebr* or cerebell* or subarachnoid) or AB (brain* or cerebr* or cerebell* or subarachnoid)
7. TI (haemorrhage* or hemorrhage* or haematoma* or hematoma* or bleed*) or AB (haemorrhage* or hemorrhage* or haematoma* or hematoma* or bleed*)
8. 6 and 7
9. (MH "Hemiplegia")
10. TI (hemipleg* or hemipar* or paresis or paretic or brain injur*) or AB (hemipleg* or hemipar* or paresis or paretic or brain injur*)
11. (MH "Brain Injuries")
12. 1 or 2 or 5 or 8 or 9 or 10 or 11
13. (MH "Upper Extremity+")
14. TI (upper limb* or upper extremit* or arm or shoulder or hand or axilla or elbow* or forearm* or finger* or wrist*) or AB (upper limb* or upper extremit* or arm or shoulder or hand or axilla or elbow* or forearm* or finger* or wrist*)
15. (MH "Lower Extremity+")
16. TI (lower limb* or lower extremit* or buttock* or foot or feet or hip or hips or knee or knees or leg or legs or thigh* or ankle* or heel* or toe or toes) or AB (lower limb* or lower extremit* or buttock* or foot or feet or hip or hips or knee or knees or leg or legs or thigh* or ankle* or heel* or toe or toes)
17. 13 or 14 or 15 or 16
18. (MH "Illusions+")
19. (MH "Reflection")
20. TI (mirror* or video* or virtual*) and AB (mirror* or video* or virtual*)
21. TI (reflect or reflection or illusion or visual feedback) or AB (reflect or reflection or illusion or visual feedback)
22. 18 or 19 or 20 or 21
23. 12 and 17 and 22

AMED Ovid

1. cerebrovascular disorders/ or cerebral hemorrhage/ or cerebral infarction/ or cerebral ischemia/ or cerebrovascular accident/ or stroke/

2. (stroke or poststroke or post-stroke or cerebrovasc$ or brain vasc$ or cerebral vasc$ or cva$ or apoplex$ or SAH).tw.

3. ((brain or cerebr$ or cerebell$ or vertebrobasil$ or hemispher$ or intracran$ or intracerebral or infratentorial or supratentorial or middle cerebral artery or MCA$ or anterior circulation or posterior circulation or basilar artery or vertebral artery or space-occupying) adj5 (isch?emi$ or infarct$ or thrombo$ or emboli$ or occlus$ or hypoxi$)).tw.

4. ((brain$ or cerebr$ or cerebell$ or intracerebral or intracran$ or parenchymal or intraparenchymal or intraventricular or infratentorial or supratentorial or basal gangli$ or putaminal or putamen or posterior fossa or hemispher$ or subarachnoid) adj5 (h?emorrhag$ or h?ematoma$ or bleed$)).tw.

5. hemiplegia/ or exp gait disorders/

6. (hemipleg$ or hemipar$ or paresis or paretic).tw.

7. 1 or 2 or 3 or 4 or 5 or 6

8. axilla/ or buttocks/ or exp extremities/

9. (upper limb$ or upper extremit$ or arm or shoulder or hand or axilla or elbow$ or forearm$ or finger$ or wrist$).tw.

10. (lower limb$ or lower extremit$ or buttock$ or foot or feet or hip or hips or knee or knees or leg or legs or thigh$ or ankle$ or heel$ or toe or toes).tw.

11. 8 or 9 or 10

12. perception/ or visual perception/

13. (mirror$ or visual$ or virtual$).tw.

14. ((limb$ or arm or leg) adj5 (mirror$ or reflect$ or reflection or illusion or visual$ or virtual$)).tw.

15. 12 or 13 or 14

16. 7 and 11 and 15

PsychInfo

1. cerebrovascular disorders/ or cerebral hemorrhage/ or exp cerebral ischemia/ or cerebral small vessel disease/ or cerebrovascular accidents/ or subarachnoid hemorrhage/

2. (stroke$ or poststroke or apoplex$ or cerebral vasc$ or brain vasc$ or cerebrovasc$ or cva$ or SAH).tw.

3. ((brain or cerebr$ or cerebell$ or vertebrobasil$ or hemispher$ or intracran$ or intracerebral or infratentorial or supratentorial or middle cerebral artery or MCA$ or anterior circulation or posterior circulation or basilar artery or vertebral artery or space-occupying) adj5 (isch? emi$ or infarct$ or thrombo$ or emboli$ or occlus$ or hypoxi$)).tw.

4. ((brain$ or cerebr$ or cerebell$ or intracerebral or intracran$ or parenchymal or intraparenchymal or intraventricular or infratentorial or supratentorial or basal gangli$ or putaminal or putamen or posterior fossa or hemispher$ or subarachnoid) adj5 (h?emorrhag$ or h? ematoma$ or bleed$)).tw.

5. hemiparesis/ or hemiplegia/

6. (hemipleg$ or hemipar$ or paresis or paraparesis or paretic).tw.

7. 1 or 2 or 3 or 4 or 5 or 6

8. "arm (anatomy)"/ or "elbow (anatomy)"/ or "hand (anatomy)"/ or "shoulder (anatomy)"/ or wrist/

9. (upper limb$ or upper extremit$ or arm or shoulder or hand or axilla or elbow$ or forearm$ or finger$ or wrist$).tw.

10. "leg (anatomy)"/ or ankle/ or "feet (anatomy)"/ or knee/ or restless leg syndrome/ or thigh/

11. (lower limb$ or lower extremit$ or buttock$ or foot or feet or hip or hips or knee or knees or leg or legs or thigh$ or ankle$ or heel$ or toe or toes).tw.

12. 8 or 9 or 10 or 11

13. mirror image/ or visual perception/

14. (mirror$ or visual$ or virtual$).tw.

15. ((limb$ or arm or leg) adj5 (mirror$ or reflect$ or reflection or illusion or visual$ or virtual$)).tw

16. 13 or 14 or 15

17. 7 and 12 and 16

18. limit 17 to yr="2011 -Current"

PEDro

<mirror*> in “Abstract and Title” field, "Intervention" field, <upper arm, shoulder or shoulder girdle> in "Body part" field, <neurology> in "Subdiscipline" field, and <clinical trial> in "Method"

<mirror*> in “Abstract and Title” field, "Intervention" field, <forearm & elbow> in "Body part" field, <neurology> in "Subdiscipline" field, and <clinical trial> in "Method"

<mirror*> in “Abstract and Title” field, "Intervention" field, <hand & wrist> in "Body part" field, <neurology> in "Subdiscipline" field, and <clinical trial> in "Method"

<mirror*> in “Abstract and Title” field, "Intervention" field, <thigh or hip> in "Body part" field, <neurology> in "Subdiscipline" field, and <clinical trial> in "Method"

<mirror*> in “Abstract and Title” field, "Intervention" field, <lower leg or knee> in "Body part" field, <neurology> in "Subdiscipline" field, and <clinical trial> in "Method"

<mirror*> in “Abstract and Title” field, "Intervention" field, <foot or ankle> in "Body part" field, <neurology> in "Subdiscipline" field, and <clinical trial> in "Method"

Appendix 3. Search straetgies for study registers

ISRCTN Registry (www.isrctn.com/)

1. mirror therapy

2. mirror AND stroke

ClinicalTrials.gov (www.clinicaltrials.gov/)

1. Condition/ Disease: stroke; Other term: mirror

2. Condition/ Disease: cerebrovascular accident; Other term: mirror

StrokeTrials Registry (www.strokecenter.org/trials/)

1. keywords: mirror

International Clinical Trials Registry Platform (ICTRP) (www.who.int/ictrp/en/)

1. mirror therapy

2. stroke AND mirror

OpenSIGLE - System for Information on Grey Literature in Europe (www.opengrey.eu/)

1. mirror therapy

REHABDATA database (www.naric.com/research/rehab)

1. mirror therapy

WHAT'S NEW

Date	Event	Description
27 September 2017	New search has been performed	Based on an updated search we include 49 new studies, bringing the total number of included studies to 62 (1982 participants) in this updated review. In this updated review we: • added a 'Summary of findings' table (Summary of findings for the main comparison); • integrated a minimum proportion of mirror therapy in the experimental condition of 50% as an inclusion criterion: we therefore excluded 1 study since only a minimal amount of experimental intervention time was mirror therapy (Ietswaart 2011); • separated outcome measures for motor function and motor impairment, and included an additional analysis for motor impairment; • excluded the analysis using change scores for analysing treatment effects; • excluded PEDro scoring for qualitative assessment and the corresponding sensitivity analysis, due to redundant qualitative scoring; • undertook a new subgroup analysis: subacute versus chronic stage after stroke; the cut-off point between both subgroups was 6 months after stroke onset.

Date	Event	Description
27 September 2017	New citation required and conclusions have changed	We added a new outcome (motor impairment) and the quality of evidence to our conclusion. Based on this, we found moderate evidence that mirror therapy is effective in improving motor function and motor impairment after stroke. Furthermore, we found moderate evidence for improved activities of daily living after mirror therapy following stroke.

CONTRIBUTIONS OF AUTHORS

Holm Thieme (HT), Christian Dohle (CD), and Nadine Morkisch (NM) were involved in all stages of the review and contributed to the conception and design of the review.
Bernhard Borgetto (BB) contributed to the conception and design of the review and was involved in interpreting the results.
Jan Mehrholz (JM) was involved in methodological planning and conducting the review, statistical analysis of outcome data, and interpreting the results. Johann Behrens (JB) and Marcus Pohl (MP) were involved in extracting data, assessing the methodological quality of selected studies, and interpreting the results.
All authors approved the protocol and the final review.

DECLARATIONS OF INTEREST

Holm Thieme (HT) is an author of an included study on the effect of mirror therapy after stroke. He was not involved in checking this trial for eligibility, extracting data or assessing the methodological quality of this study. He has received and will receive honorarium for presentations and seminars on mirror therapy.

Christian Dohle (CD) is author of two included studies on the effect of mirror therapy after stroke. He was not involved in checking these trials for eligibility, extracting data or assessing the methodological quality of the studies. He has received and will receive honorarium for presentations and seminars on mirror therapy.

Christian Dohle (CD) and Nadine Morkisch (NM) are authors of corresponding therapy manuals (Bieniok 2011; Morkisch 2015).

Jan Mehrholz: None known

Marcus Pohl: Marcus Pohl (MP) is an author of an included study on the effect of mirror therapy after stroke. He was not involved in checking this trial for eligibility, extracting data or assessing the methodological quality of this study.

Johann Behrens: Johann Begrens (JB) is an author of an included study on the effect of mirror therapy after stroke. He was not involved in checking this trial for eligibility, extracting data or assessing the methodological quality of this study.

Bernhard Borgetto: None known

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- Median Klinik Berlin-Kladow, Germany.

External sources

- BMBF, Germany.

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- BMBF, Germany.

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DIFFERENCES BETWEEN PROTOCOL AND REVIEW

We added the outcome 'motor impairment' for this update and separated outcome measures for motor function and motor impairment.

We undertook a new subgroup analysis: subacute versus chronic stage after stroke: the cut-off point between both subgroups was six months after stroke onset.

We added a further database for searching ongoing studies: International Clinical Trials Registry Platform (ICTRP).

We had previously planned to perform a subgroup analysis comparing studies that included participants with different severities of motor impairment. Based on the baseline data for motor function, we were not able to clearly differentiate studies based on this criterion. Most studies included participants with mixed severities of motor impairments. Due to these problems of differentiation, we decided not to do this subgroup analysis.

Two studies only included people after stroke with a diagnosis of CRPS-type I, which might have influenced the effects of the intervention (Cacchio 2009a; Cacchio 2009b). We therefore performed a post hoc sensitivity analysis by removing these studies; this was not planned in the protocol.

We only included studies with a minimum amount of 50% mirror therapy in the experimental intervention.

INDEX TERMS

Medical Subject Headings (MeSH)

*Recovery of Function; Activities of Daily Living; Exercise Movement Techniques [instrumentation] [*methods]; Functional Laterality [physiology]; Paresis [etiology] [*rehabilitation]; Randomized Controlled Trials as Topic; Stroke [complications]; Stroke Rehabilitation [*methods]

MeSH check words

Adult; Aged; Humans; Middle Aged