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Transcranial direct current stimulation (tDCS) for improving activities of daily living, and physical and cognitive functioning, in people after stroke (Review)

Elsner B, Kugler J, Pohl M, Mehrholz J

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[Intervention Review]

Transcranial direct current stimulation (tDCS) for improving activities of daily living, and physical and cognitive functioning, in people after stroke

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ABSTRACT

Background

Stroke is one of the leading causes of disability worldwide. Functional impairment, resulting in poor performance in activities of daily living (ADLs) among stroke survivors is common. Current rehabilitation approaches have limited effectiveness in improving ADL performance, function, muscle strength and cognitive abilities (including spatial neglect) after stroke, but a possible adjunct to stroke rehabilitation might be non-invasive brain stimulation by transcranial direct current stimulation (tDCS) to modulate cortical excitability, and hence to improve ADL performance, arm and leg function, muscle strength and cognitive abilities (including spatial neglect), dropouts and adverse events in people after stroke.

Objectives

To assess the effects of tDCS on ADLs, arm and leg function, muscle strength and cognitive abilities (including spatial neglect), dropouts and adverse events in people after stroke.

Search methods

We searched the Cochrane Stroke Group Trials Register (February 2015), the Cochrane Central Register of Controlled Trials (CENTRAL; the Cochrane Library; 2015, Issue 2), MEDLINE (1948 to February 2015), EMBASE (1980 to February 2015), CINAHL (1982 to February 2015), AMED (1985 to February 2015), Science Citation Index (1899 to February 2015) and four additional databases. In an effort to identify further published, unpublished and ongoing trials, we searched trials registers and reference lists, handsearched conference proceedings and contacted authors and equipment manufacturers.

Selection criteria

This is the update of an existing review. In the previous version of this review we focused on the effects of tDCS on ADLs and function. In this update, we broadened our inclusion criteria to compare any kind of active tDCS for improving ADLs, function, muscle strength and cognitive abilities (including spatial neglect) versus any kind of placebo or control intervention.

Data collection and analysis

Two review authors independently assessed trial quality and risk of bias (JM and MP) and extracted data (BE and JM). If necessary, we contacted study authors to ask for additional information. We collected information on dropouts and adverse events from the trial reports.

Main results

We included 32 studies involving a total of 748 participants aged above 18 with acute, postacute or chronic ischaemic or haemorrhagic stroke. We also identified 55 ongoing studies. The risk of bias did not differ substantially for different comparisons and outcomes.

We found nine studies with 396 participants examining the effects of tDCS versus sham tDCS (or any other passive intervention) on our primary outcome measure, ADLs after stroke. We found evidence of effect regarding ADL performance at the end of the intervention period (standardised mean difference (SMD) 0.24, 95% confidence interval (CI) 0.03 to 0.44; inverse variance method with random-effects model; moderate quality evidence). Six studies with 269 participants assessed the effects of tDCS on ADLs at the end of follow-up, and found improved ADL performance (SMD 0.31, 95% CI 0.01 to 0.62; inverse variance method with random-effects model; moderate quality evidence). However, the results did not persist in a sensitivity analysis including only trials of good methodological quality.

One of our secondary outcome measures was upper extremity function: 12 trials with a total of 431 participants measured upper extremity function at the end of the intervention period, revealing no evidence of an effect in favour of tDCS (SMD 0.01, 95% CI -0.48 to 0.50 for studies presenting absolute values (low quality evidence) and SMD 0.32, 95% CI -0.51 to 1.15 (low quality evidence) for studies presenting change values; inverse variance method with random-effects model). Regarding the effects of tDCS on upper extremity function at the end of follow-up, we identified four studies with a total of 187 participants (absolute values) that showed no evidence of an effect (SMD 0.01, 95% CI -0.48 to 0.50; inverse variance method with random-effects model; low quality evidence). Ten studies with 313 participants reported outcome data for muscle strength at the end of the intervention period, but in the corresponding meta-analysis there was no evidence of an effect. Three studies with 156 participants reported outcome data on muscle strength at follow-up, but there was no evidence of an effect.

In six of 23 studies (26%), dropouts, adverse events or deaths that occurred during the intervention period were reported, and the proportions of dropouts and adverse events were comparable between groups (risk difference (RD) 0.01, 95% CI -0.02 to 0.03; Mantel-Haenszel method with random-effects model; low quality evidence; analysis based only on studies that reported either on dropouts, or on adverse events, or on both). However, this effect may be underestimated due to reporting bias.

Authors' conclusions

At the moment, evidence of very low to moderate quality is available on the effectiveness of tDCS (anodal/cathodal/dual) versus control (sham/any other intervention) for improving ADL performance after stroke. However, there are many ongoing randomised trials that could change the quality of evidence in the future. Future studies should particularly engage those who may benefit most from tDCS after stroke and in the effects of tDCS on upper and lower limb function, muscle strength and cognitive abilities (including spatial neglect). Dropouts and adverse events should be routinely monitored and presented as secondary outcomes. They should also address methodological issues by adhering to the Consolidated Standards of Reporting Trials (CONSORT) statement.

PLAIN LANGUAGE SUMMARY

Direct electrical current to the brain to improve rehabilitation outcomes

Review question

We reviewed the evidence about the effect of direct electrical current to the brain (transcranial direct current stimulation, tDCS) to reduce impairment in activities of daily living (ADLs), arm and leg function, muscle strength and cognitive abilities (including spatial neglect), dropouts and adverse events in people after stroke.

Background

Stroke is one of the leading causes of disability worldwide. Most strokes take place when a blood clot blocks a blood vessel leading to the brain. Without a proper blood supply, the brain quickly suffers damage, which can be permanent. This damage often causes impairment of ADLs and motor function among stroke survivors. Current rehabilitation strategies have limited effectiveness in improving these

impairments. One possibility for enhancing the effects of rehabilitation might be the addition of non-invasive brain stimulation through a technique known as transcranial direct current stimulation (tDCS). This technique can alter how the brain works and may be used to reduce impairment of ADLs and function. However, the effectiveness of this intervention for improving rehabilitation outcomes is still unknown.

Search date

The review is current to February 2015.

Study characteristics

We included 32 studies involving a total of 748 participants aged above 18 with acute, postacute or chronic ischaemic or haemorrhagic stroke. The mean age in the experimental groups ranged from 43 years up to 70 years and from 45 years up to 75 years in the control groups. The level of participants' impairment ranged from severe to moderate. The majority of studies were conducted in an inpatient setting. Different stimulation types (anodal, cathodal, dual) of tDCS with different stimulation durations and dosages were administered and compared with sham tDCS or an active control intervention. Sham tDCS means that the stimulation is switched off covertly in the first minute of the intervention.

Key results

This review found that tDCS might enhance ADLs, but it is still uncertain if arm and leg function, muscle strength and cognitive abilities may be improved. Proportions of adverse events and people discontinuing the treatment were comparable between groups. Included studies differed in terms of type, location and duration of stimulation, amount of current delivered, electrode size and positioning as well as type and location of stroke. Future research is needed in this area to foster the evidence base of these findings, especially regarding arm and leg function, muscle strength and cognitive abilities (including spatial neglect).

Quality of the evidence

The quality of evidence for tDCS for improving ADLs was very low to moderate. It was low for upper extremity function and low for adverse events and people discontinuing the treatment.

SUMMARY OF FINDINGS FOR THE MAIN COMPARISON *[Explanation]*

tDCS versus any type of placebo or passive control intervention for improving function, and activities of daily living, cognitive abilities and neglect in people after stroke

Patient or population: people with improving function, and activities of daily living, cognitive abilities and neglect after stroke
Settings: unspecified
Intervention: tDCS versus any type of placebo or passive control intervention

Outcomes	Illustrative comparative risks* (95% CI): Corresponding risk tDCS versus any type of placebo or passive control intervention	No. of participants (studies)	Quality of the evidence (GRADE)	Comments
Primary outcome measure: ADLs at the end of the intervention period - absolute values Measures of activities of daily living. Scale from: 0 to infinity	The mean primary outcome measure: ADLs at the end of the intervention period - absolute values in the intervention groups was **0.24 standard deviations higher** (0.03 to 0.44 higher)	396 (9 studies)	⊕⊕⊕◯ **moderate**[1]	SMD 0.24 (0.03 to 0.44) ; however, this effect was not sustained when including only studies with adequate allocation concealment (Table 3)
Primary outcome measure: ADLs at the end of the intervention period - change scores Measures of activities of daily living. Scale from: 0 to infinity	The mean primary outcome measure: ADLs at the end of the intervention period - change scores in the intervention groups was **0.46 standard deviations higher** (0.75 lower to 1.67 higher)	11 (1 study)	⊕◯◯◯ **very low**[1,2,3]	SMD 0.46 (-0.75 to 1.67)
Primary outcome measure: ADLs until the end of follow-up Measures of activities of daily living. Scale from: 0 to infinity Follow-up: mean 3 months	The mean primary outcome measure: ADLs until the end of follow-up in the intervention groups was **0.31 standard deviations higher** (0.01 to 0.62 higher)	269 (6 studies)	⊕⊕⊕◯ **moderate**[4]	SMD 0.31 (0.01 to 0.62) ; however, this effect was not sustained when including only studies with adequate allocation concealment (Table 4)

Secondary outcome measure: upper extremity function at the end of the intervention period - absolute values Clinical measures of upper extremity function. Scale from: 0 to infinity	The mean secondary outcome measure: upper extremity function at the end of the intervention period - absolute values in the intervention groups was **0.11 standard deviations higher** (0.17 lower to 0.39 higher)		431 (12 studies)	⊕⊕◯◯ **low**[1,2]	SMD 0.11 (-0.17 to 0.39)
Secondary outcome measure: upper extremity function at the end of the intervention period - change scores Clinical measures of upper extremity function. Scale from: 0 to infinity	The mean secondary outcome measure: upper extremity function at the end of the intervention period - change scores in the intervention groups was **0.32 standard deviations higher** (0.51 lower to 1.15 higher)		53 (4 studies)	⊕⊕◯◯ **low**[1,2]	SMD 0.32 (-0.51 to 1.15)
Secondary outcome measure: upper extremity function to the end of follow-up - absolute values Clinical measures of upper extremity function. Scale from: 0 to infinity Follow-up: mean 3 months	The mean secondary outcome measure: upper extremity function to the end of follow-up - absolute values in the intervention groups was **0.01 standard deviations higher** (0.48 lower to 0.50 higher)		187 (4 studies)	⊕⊕◯◯ **low**[2,3]	SMD 0.01 (-0.48 to 0.50)
Secondary outcome measure: dropouts, adverse events and deaths during the in-	**Study population**	See comment	664 (23 studies)	⊕⊕◯◯ **low**[1,2]	Risks were calculated from pooled risk differences

tervention period Number of adverse events, dropouts and deaths during the intervention period			
	20 per 1000	**48 per 1000** (10 to 80)	
	Moderate		
	0 per 1000	**0 per 1000** (0 to 0)	

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (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).
ADL: activities of daily living; **CI:** Confidence interval; SMD: standardised mean difference; tDCS: transcranial direct current stimulation

GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

[1] Downgraded due to several ratings with 'unclear' or 'high' risk of bias.
[2] Downgraded because 95% CI contains effect size of no difference and the minimal important difference.
[3] Downgraded because the total sample size is less than 400 (as a rule of thumb).
[4] Downgraded because the results did not persist, when only studies of high methodological quality were included.

BACKGROUND

Description of the condition

Every year, 15 million people worldwide suffer from stroke (WHO 2011), and of those, nearly six million die (Mathers 2011). Another five million people are left permanently disabled every year (WHO 2011). Hence, stroke is one of the leading causes of death worldwide and has a considerable impact on disease burden (WHO 2011). Stroke affects function and many activities of daily living (ADLs). Three out of four patients have an impairment in performing ADLs at hospital admission, and only about one-third of patients who have completed rehabilitation have achieved normal neurological function (Jørgensen 1999). Every second patient does not regain function of the affected arm six months after stroke (Kwakkel 2003). Three out of four people with stroke suffer from working memory impairment and may thus experience executive dysfunction (Riepe 2004). Based on the rating by people with stroke, carers and health professionals, improving cognition after stroke is the number one research priority after stroke (Pollock 2012). Therefore, neurological rehabilitation, including effective training strategies, is needed (especially therapies tailored to patients' and carers' needs) to facilitate recovery and to reduce the burden of stroke (Barker 2005).

Description of the intervention

Transcranial direct current stimulation (tDCS) is a non-invasive method used to modulate cortical excitability by applying a direct current to the brain (Bindman 1964; Nowak 2009; Purpura 1965). Stimulation of the central nervous system by tDCS is inexpensive when compared with repetitive transcranial magnetic stimulation (rTMS) and epidural stimulation (Hesse 2011).

How the intervention might work

Transcranial direct current stimulation (tDCS) usually is delivered via saline-soaked surface sponge electrodes, which are connected to a direct current stimulator of low intensity (Lang 2005). Three different applications might be used: 1) the anodal electrode may be placed over the presumed area of interest of the brain with the cathodal electrode placed above the contralateral orbit (anodal stimulation, A-tDCS); 2) the cathodal electrode may be placed over the presumed area of interest of the brain with the anodal electrode placed above the contralateral orbit (cathodal stimulation, C-tDCS) (Hesse 2011); or 3) anodal stimulation and cathodal stimulation may be applied simultaneously (dual-tDCS) (Lindenberg 2010). Primarily resulting from a shift of the resting potential of the brain's neurons, tDCS using anodal stimulation might lead to increased cortical excitability, whereas cortical stimulation might lead to decreased excitability (Bindman 1964; Floel 2010; Purpura 1965). Stimulation lasting for longer than five minutes might induce significant after-effects (which probably are mainly due to changes in synaptic mechanisms), which could last up to several hours (Nitsche 2001; Nitsche 2003). These effects probably are 1) anatomically specific (referring to how the electrodes are positioned and which way the current takes to reach the targeted brain areas); 2) activity selective and task specific (meaning that neuronal networks active during a certain activity are preferentially stimulated by tDCS); and 3) input selective (meaning that tDCS would alter the neuronal system's input and thereby enhance information processing) (Bikson 2013). The facilitating effect of tDCS could be used to facilitate motor learning in healthy people (Boggio 2006; Jeffery 2007; Nitsche 2001; Nitsche 2003; Reis 2009) and appears to be a promising option in rehabilitation after stroke.

Why it is important to do this review

The previous version of this review suggested that, among people with stroke, tDCS with or without simultaneous upper extremity training, has led to greater improvement in arm motor function when compared with sham tDCS alone (Elsner 2013). Some pilot studies have even reported improvement in ADLs, such as, turning over playing cards, picking up beans with a spoon, and manipulating light and heavy objects with the arm (Fregni 2005; Hummel 2005; Kim 2009). However, these findings were not supported by a large-scale multicentre randomised controlled trial (RCT), which did not find any effects on measures of ADL (Hesse 2011). There is contradictory evidence on the additional effect of tDCS on lower extremity function and gait (Cha 2014; Fusco 2014; Geroin 2011; Tahtis 2012). There are indications that tDCS might also improve working memory or neglect by modulating excitability of the corresponding brain areas (Au-Yeung 2014; Jo 2008; Kang 2008a; Ko 2008; Park 2013; Sunwoo 2013). However, in a systematic review of RCTs about the effects of tDCS on aphasia, no evidence of an effect was found (Elsner 2015). Despite the fact that adverse effects associated with the application of tDCS have been reported rarely so far, concerns about the safety of tDCS regarding its impact on cerebral autoregulation have recently emerged (List 2015; Nitsche 2015).

To date, studies of tDCS have tended to include small sample sizes. Currently, no systematic review has comprehensively synthesised the findings of available RCTs. Therefore, a systematic review of RCTs investigating the effectiveness and acceptability of tDCS for improving ADLs, motor function and cognitive abilities (including spatial neglect) in people with stroke is required.

OBJECTIVES

To assess the effects of transcranial direct current stimulation (tDCS) on activities of daily living (ADLs), arm and leg function,

muscle strength and cognitive abilities (including spatial neglect), dropouts and adverse events in people after stroke.

METHODS

Criteria for considering studies for this review

Types of studies

We included randomised controlled trials (RCTs) and randomised controlled cross-over trials, from which we analysed only the first period as a parallel-group design. We did not include quasi-RCTs.

Types of participants

We included adult participants (over 18 years of age) who had experienced a stroke. We used the World Health Organization (WHO) definition of stroke (Hatano 1976), or a clinical definition, if not specifically stated (i.e. signs and symptoms persisting longer than 24 hours). We included participants regardless of initial level of impairment, duration of illness, or gender.

Types of interventions

This is the update of an existing review. In the previous version of this review we focused on the effects of transcranial direct current stimulation (tDCS) on activities of daily living (ADLs) and function. In this update, we broadened our inclusion criteria to compare any kind of active tDCS for improving ADLs, function, muscle strength and cognitive abilities (including spatial neglect) versus any kind of placebo or control intervention (i.e. sham tDCS, no intervention or conventional motor rehabilitation). We defined active tDCS as the longer-lasting (lasting longer than one minute) application of a direct current to the brain to stimulate the affected hemisphere, or to inhibit the healthy hemisphere. We defined sham tDCS as short-term direct current stimulation (lasting less than one minute; this is approximately the time it usually takes to fade in and fade out the current in sham-controlled tDCS trials in order to produce perceivable sensations on the skin similar to active tDCS (Gandiga 2006), or placement of electrodes with no direct current applied. If more than one active or sham or control group investigated the same content, we combined these into one group each (e.g. if two sham control groups were included, we combined them into a single sham group for comparison with the active group).

Types of outcome measures

Primary outcomes

The primary outcome was activities of daily living (ADLs), regardless of their outcome measurement. However, we prioritised generally accepted outcome measures in the following order to facilitate quantitative pooling.

1. Frenchay Activities Index (FAI) (Schuling 1993).
2. Barthel ADL Index (BI) (Mahoney 1965).
3. Rivermead ADL Assessment (Whiting 1980).
4. Modified Rankin Scale (mRS) (Bonita 1988).
5. Functional Independence Measure (FIM) (Hamilton 1994).

We analysed primary outcomes according to their time point of measurement as follows: 1) at the end of the study period; and 2) at follow-up: from three to 12 months after the study end. In cases where included studies reported ADLs in other measures than those mentioned above, all review authors discussed and reached consensus about the outcome measures to be included in the primary outcome analysis.

Secondary outcomes

In this update we defined secondary outcomes as upper limb function, lower limb function, muscle strength, cognitive abilities (including spatial neglect), dropouts and adverse events (including death from all causes), with appropriate measures as reported in the studies. We preferred interval-scaled outcome measures rather than ordinal-scaled or nominal-scaled ones. We prioritised secondary outcome measures as follows.

For upper limb function:

1. Action Research Arm Test (ARAT) (Lyle 1981);
2. Fugl-Meyer Score (Fugl-Meyer 1975);
3. Nine-Hole Peg Test (NHPT) (Sharpless 1982); and
4. Jebsen Taylor Hand Function Test (JTT) (Jebsen 1969).

For lower limb function:

1. walking velocity (in metres per second);
2. walking capacity (metres walked in six minutes); and
3. Functional Ambulation Categories (FAC) (Holden 1984).

For muscle strength:

1. grip force (measured by handheld dynamometer) (Boissy 1999); and
2. Motricity Index Score (Demeurisse 1980).

For cognitive abilities, such as working memory, attention and spatial neglect:

1. Montreal Cognitive Assessment (Nasreddine 2005);
2. Clock Drawing Test (Goodglass 1983);
3. Executive Function (Assessments have been described in Chung 2013);
4. target cancellation (Molenberghs 2011);
5. line bisection (Molenberghs 2011);
6. other measures of cognitive abilities; and
7. other measures of spatial neglect.

Depending on the measurements provided in the included trials, all review authors discussed and reached consensus about which

outcome measures should be included in the analysis of secondary outcomes.

Search methods for identification of studies

See the 'Specialized 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

According to the increased scope of this update we re-ran our searches with updated search strategies of the Cochrane Stroke Group Trials Register (March 2015) and the following electronic bibliographic databases.

1. Cochrane Central Register of Controlled Trials (CENTRAL; the Cochrane Library; 2015, Issue 2) (Appendix 1).
2. MEDLINE (1948 to February 2015) (Appendix 2).
3. EMBASE (1980 to February 2015) (Appendix 3).
4. CINAHL (1982 to February 2015) (Appendix 4).
5. AMED (1985 to February 2015) (Appendix 5).
6. Science Citation Index (Web of Science) (1899 to February 2015) (Appendix 6).
7. Physiotherapy Evidence Database (PEDro) at http://www.pedro.org.au/ (March 2015) (Appendix 7).
8. Rehabdata at www.naric.com/?q=REHABDATA (1956 to March 2015) (Appendix 8).
9. Compendex (1969 to May 2013) (Appendix 9).
10. Inspec (1969 to March 2015) (Appendix 10).

We developed the MEDLINE search strategy with the help of the Cochrane Stroke Group Trials Search Co-ordinator and adapted it for the other databases.

We also searched the following ongoing trials and research registers (June 2015).

1. Stroke Trials Registry (www.strokecenter.org/trials/).
2. Current Controlled Trials (www.controlled-trials.com/).
3. ClinicalTrials.gov (http://clinicaltrials.gov).
4. EU Clinical Trials Register (www.clinicaltrialsregister.eu/).
5. WHO International Clinical Trials Registry Platform (http://apps.who.int/trialsearch/).

Searching other resources

We carried out the following additional searches to identify further published, unpublished and ongoing trials not available in the aforementioned databases.

1. Handsearched the following relevant conference proceedings, which had not already been searched by the Cochrane Stroke Group.
   i) 3rd, 4th, 5th, 6th and 7th World Congress of NeuroRehabilitation (2002, 2006, 2008, 2010, 2012 and 2014).
   ii) 1st, 2nd, 3rd, 4th, 5th and 6th World Congress of Physical and Rehabilitation Medicine (2001, 2003, 2005, 2007, 2009, 2011 and 2013).
   iii) Deutsche Gesellschaft für Neurotraumatologie und Klinische Neurorehabilitation (2001 to 2014).
   iv) Deutsche Gesellschaft für Neurologie (2000 to 2014).
   v) Deutsche Gesellschaft für Neurorehabilitation (1999 to 2014).
   vi) 1st, 2nd and 3rd Asian Oceania Conference of Physical and Rehabilitation Medicine (2008, 2010, 2012 and 2014).
2. Screened reference lists from relevant reviews, articles and textbooks.
3. Contacted authors of identified trials and other researchers in the field.
4. Used Science Citation Index Cited Reference Search for forward tracking of important articles.
5. Contacted the following equipment manufacturers (June 2015).
   i) Activatek, Salt Lake City, USA (www.activatekinc.com).
   ii) Changsha Zhineng Electronics, Changsha City, Hunan, China (www.cszhineng.diytrade.com).
   iii) DJO Global, Vista, USA (www.djoglobal.com).
   iv) Grindhouse (www.grindhousewetware.com).
   v) Magstim, Spring Gardens, UK (www.magstim.com).
   vi) Neuroconn, Ilmenau, Germany (www.neuroconn.de).
   vii) Neuroelectrics, Barcelona, Spain (www.neuroelectrics.com).
   viii) Newronika, Milano, Italy (www.newronika.it).
   ix) Soterix Medical, New York City, USA (www.soterixmedical.com).
   x) Trans Cranial Technologies, Hong Kong (www.transcranial.com).
6. Searched Google Scholar (http://scholar.google.com/) (June 2015).

Data collection and analysis

Selection of studies

One review author (BE) read the titles and abstracts of records identified by the electronic searches and eliminated obviously irrelevant studies. We retrieved the full-text of the remaining studies, and two review authors (JK and BE) independently ranked the studies as relevant, possibly relevant or irrelevant according to our inclusion criteria (types of studies, participants and aims of interventions). Two review authors (JM and MP) then examined whether the possibly relevant publications fit the population, intervention, comparison, outcome (PICO) strategy of our study question. We included all trials rated as relevant, or possibly relevant, and excluded all trials ranked as irrelevant. We resolved dis-

agreements by discussion with all review authors. If we needed further information to resolve disagreements concerning including or excluding a study, we contacted the trial authors and requested the required information. We recorded the selection process in sufficient detail to complete a PRISMA flow diagram (Moher 2009), and listed in the Characteristics of excluded studies table all studies that did not match our inclusion criteria regarding types of studies, participants and aims of interventions.

Data extraction and management

Two review authors (BE and JM) independently extracted trial and outcome data from the selected trials. If one of the review authors was involved in an included trial, another review author extracted trial and outcome data from that trial. In accordance with the 'Risk of bias' tool implemented in Review Manager 5 (RevMan 2014), we used checklists to independently assess:

1. methods of random sequence generation;
2. methods of allocation concealment;
3. blinding of assessors;
4. use of an intention-to-treat (ITT) analysis;
5. adverse effects and dropouts;
6. important differences in prognostic factors;
7. participants (country, number of participants, age, gender, type of stroke, time from stroke onset to study entry and inclusion and exclusion criteria);
8. comparison (details of interventions in treatment and control groups, duration of treatment and details of cointerventions in the groups);
9. outcomes; and
10. their time point of measurement.

Further, we extracted data on initial ADL ability or initial functional ability, or both.

BE and JM checked the extracted data for agreement. If necessary, we contacted trialists to obtain more information.

Assessment of risk of bias in included studies

Two review authors (JM and MP) independently assessed the risk of bias in the included trials according to Chapter 8 of the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011a). We assessed the risk of bias according to the following domains.

1. Random sequence generation.
2. Allocation concealment.
3. Blinding of participants and personnel.
4. Blinding of outcome assessment.
5. Incomplete outcome data.
6. Selective outcome reporting.
7. Other bias.

We judged each potential source of bias as high, low or unclear and provide a quote from the study report together with a justification for our judgement in the 'Risk of bias' table. We summarised the risk of bias judgements across different studies for each of the domains listed. We resolved disagreements in methodological assessment by reaching consensus through discussion by all review authors. We contacted trialists to ask for clarification and to request missing information.

Measures of treatment effect

For all outcomes that were continuous data, we entered means and standard deviations (SDs). We calculated a pooled estimate of the mean difference (MD) with 95% confidence intervals (CIs). If studies did not use the same outcomes, we calculated standardised mean differences (SMDs) instead of MDs. For all binary outcomes, we calculated risk differences (RDs) with 95% CIs. In case different scales measured the same outcome but in some scales a higher value indicated better performance and in other scales a lower value indicated better performance, we multiplied the values of the corresponding scales by -1 to ensure a consistent direction of the effect across all outcome measurements.

For all statistical comparisons we used the current version of Review Manager 5 (RevMan 2014).

Assessment of heterogeneity

We used the I^2 statistic to assess heterogeneity. We used a random-effects model, regardless of the level of heterogeneity. Thus, when heterogeneity occurred, we could not violate the preconditions of a fixed-effect model approach.

Data synthesis

GRADE and 'Summary of findings' table

We created two 'Summary of findings' tables using the following outcomes.

1. Primary outcome measure: ADLs at the end of the intervention period - absolute values. Measures of activities of daily living. Scale from: 0 to infinity
2. Primary outcome measure: ADLs at the end of the intervention period - change scores. Measures of activities of daily living. Scale from: 0 to infinity.
3. Primary outcome measure: ADLs until the end of follow-up. Measures of activities of daily living. Scale from: 0 to infinity. Follow-up: mean 3 months.
4. Secondary outcome measure: upper extremity function at the end of the intervention period - absolute values. Clinical measures of upper extremity function. Scale from: 0 to infinity.
5. Secondary outcome measure: upper extremity function at the end of the intervention period - change scores. Clinical measures of upper extremity function. Scale from: 0 to infinity.
6. Secondary outcome measure: upper extremity function to the end of follow-up - absolute values. Clinical measures of upper extremity function. Scale from: 0 to infinity. Follow-up: mean 3 months.

7. Secondary outcome measure: dropouts, adverse events and deaths during the intervention period. Number of adverse events, dropouts and deaths during the intervention period.

We used the five GRADE considerations (study limitations, consistency of effect, imprecision, indirectness and publication bias) to assess the quality of a body of evidence as it relates to the studies which contribute data to the meta-analyses for the prespecified outcomes (Atkins 2004). We used methods and recommendations described in Section 8.5 and Chapter 12 of the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011c) using GRADEproGDT software (GRADEpro). We justified all decisions to down- or up-grade the quality of studies using footnotes, and we made comments to aid the reader's understanding of the review where necessary.

Subgroup analysis and investigation of heterogeneity

If at least two studies were available for each group (tDCS/sham), we conducted planned analyses of the following subgroups for our primary outcome of ADL.

1. Duration of illness: acute/subacute phase (the first week after stroke and the second to the fourth week after stroke, respectively) versus the postacute phase (from the first to the sixth month after stroke) versus the chronic phase (more than six months after stroke).
2. Type of stimulation: cathodal versus anodal and position of electrodes/location of stimulation.
3. Type of control intervention: active (e.g. conventional therapy) versus passive (sham tDCS or no intervention).

All stratified (subgroup) analyses were accompanied by appropriate tests for interaction (statistical tests for subgroup differences as described in the *Cochrane Handbook for Systematic Review of Interventions* (Higgins 2011b), as implemented in Review Manager 5 (RevMan 2014).

Sensitivity analysis

We incorporated a post hoc sensitivity analysis for methodological quality to test the robustness of our results. We analysed concealed allocation, blinding of assessors, and ITT.

RESULTS

Description of studies

Results of the search

2013 version

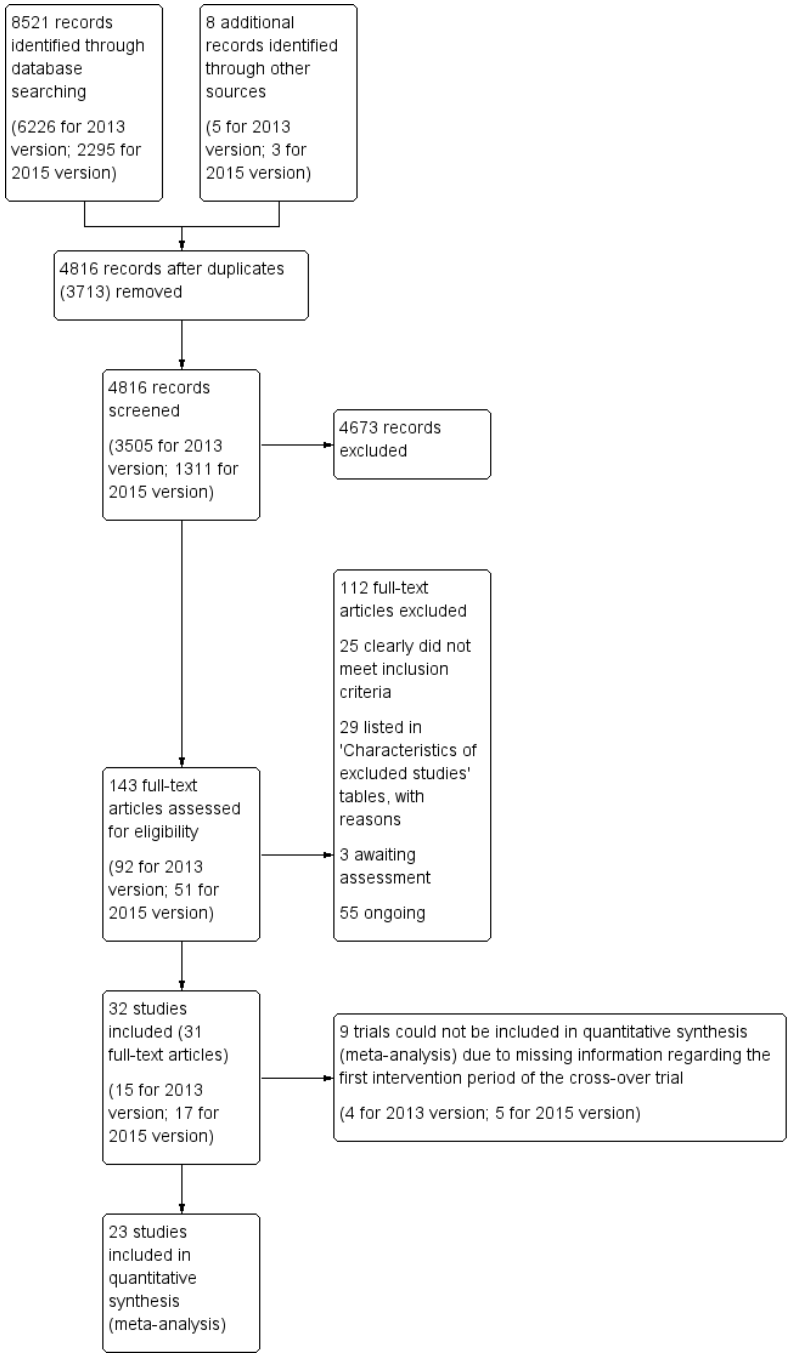
For the 2013 version of this review, we identified 6226 potentially relevant trials through electronic searching; we considered 92 full papers and included 15 trials with 455 participants (Boggio 2007a; Bolognini 2011; Fregni 2005a; Fusco 2013a; Geroin 2011; Hesse 2011; Khedr 2013; Kim 2009; Kim 2010; Lindenberg 2010; Mahmoudi 2011; Nair 2011; Qu 2009; Rossi 2013; Wu 2013a).

2015 version

In this update, we identified a total of 2295 records through the searches. After screening titles and abstracts, we obtained the full-text of 52 articles. After further assessment, we determined that 17 new studies met the review inclusion criteria, and three studies are awaiting classification, as more information is required. We identified 55 ongoing pilot and large-scale randomised trials with a cumulative estimated enrolment of 3339 participants (mean (SD) sample size: 65 (53); median sample size: 45; range of sample size: 6-250). The majority of ongoing studies are performed in the USA, Brazil, Belgium, France, the Netherlands, and Germany.

The flow of references is shown in Figure 1.

Figure 1. Study flow diagram. Please note that the number of full-texts is not necessarily equal to the number of studies (e.g. The studies Di Lazzaro 2014a and Di Lazzaro 2014b have been presented in a single full-text. Moreover there often are several full-texts of a single trial (e.g. as is the case for Hesse 2011 or Nair 2011).



Included studies

Design

We included 32 studies involving a total of 748 participants in the qualitative analysis (see Characteristics of included studies). All studies investigated the effects of transcranial direct current stimulation (tDCS) versus sham tDCS, except Cha 2014 and Qu 2009, which compared tDCS with physical therapy alone. Eleven trials with 105 participants were randomly assigned cross-over trials (Au-Yeung 2014; Boggio 2007a; Fregni 2005a; Fusco 2013a; Jo 2008; Kang 2008a; Kim 2009; Ko 2008; Mahmoudi 2011; Sohn 2013; Sunwoo 2013), whereas the remaining 21, with 643 participants, were RCTs (Ang 2012; Bolognini 2011; Cha 2014; Di Lazzaro 2014a; Di Lazzaro 2014b; Fusco 2014; Geroin 2011; Hesse 2011; Khedr 2013; Kim 2010; Lee 2014; Lindenberg 2010; Nair 2011; Park 2013; Qu 2009; Rossi 2013; Tahtis 2012; Tedesco Triccas 2015b; Viana 2014; Wang 2014; Wu 2013a).

Sample sizes

The sample sizes of included studies ranged from four in Boggio 2007a to 96 in Hesse 2011, with a mean (SD) sample size of 24 (23). The median sample size was 14.

Setting

Ten of the included studies were conducted in the Republic of Korea, six in Italy, three in the USA, three in China, two in Brazil, one in Iran, one in Egypt, one in the UK, one in Singapore, and one in Germany/Italy. In three studies, the country was not stated clearly.

Participants

The proportion of participants with ischaemic stroke ranged from 36% in Sohn 2013 to 100% in Fusco 2014. The mean age in the experimental groups ranged from 43 years in Bolognini 2011 to 70 years in Kang 2008a, and from 45 years in Qu 2009 to 75 years in the control groups (Boggio 2007a). The proportion of women participating in the included studies ranged from 0% in Au-Yeung 2014 and Boggio 2007a to 71% in Bolognini 2011. See Table 1 for a comprehensive summary of participant characteristics.

Interventions

The experimental groups received anodal stimulation (A-tDCS) (Au-Yeung 2014; Boggio 2007a; Bolognini 2011; Fregni 2005a; Fusco 2013a; Geroin 2011; Hesse 2011; Jo 2008; Kang 2008a; Ko 2008; Khedr 2013; Kim 2009; Kim 2010; Mahmoudi 2011; Park 2013; Rossi 2013; Sohn 2013; Sunwoo 2013; Tedesco Triccas 2015b; Viana 2014; Wang 2014), cathodal stimulation (C-tDCS) (Au-Yeung 2014; Boggio 2007a; Fregni 2005a; Fusco 2013a; Fusco 2014; Hesse 2011; Khedr 2013; Kim 2010; Lee 2014; Mahmoudi 2011; Nair 2011; Qu 2009; Wu 2013a) or dual-tDCS (anodal plus cathodal stimulation simultaneously) (Ang 2012; Di Lazzaro 2014a; Di Lazzaro 2014b; Fusco 2013a; Lindenberg 2010; Mahmoudi 2011; Tahtis 2012), and the control groups of all included studies except Cha 2014, Qu 2009 and Lee 2014 received sham tDCS or physical therapy or virtual reality, respectively, as a control intervention. See Table 2 for a comprehensive summary of intervention characteristics, dropouts and adverse events.

Outcomes

A widely used outcome was the Barthel Index (BI) and the Upper Extremity Fugl-Meyer Score (UE-FM). Twenty-two out of 32 studies (69%) have reported data on dropouts and 13 out of 32 studies (41%) have reported data on adverse events.

We had to exclude nine of the included trials from quantitative syntheses (meta-analyses) because of missing information regarding the first intervention period of the cross-over trial (Au-Yeung 2014; Fregni 2005a; Jo 2008; Kang 2008a; Kim 2009; Ko 2008; Mahmoudi 2011; Sohn 2013; Sunwoo 2013).

Excluded studies

We excluded 29 trials from qualitative assessment (Boggio 2007b; Bradnam 2012; Byblow 2011; Celnik 2009; Danzl 2012; Edwards 2009; Gandiga 2006; Giacobbe 2013; Goh 2015; Gurchin 1988; Hummel 2005a; Hummel 2005b; Jayaram 2009; Kasashima 2012; Kharchenko 2001; Kitisomprayoonkul 2012; Kumar 2011; Kwon 2012; Lee 2012; Lefebvre 2013; Lefebvre 2015; Madhavan 2011; Manganotti 2011; Ochi 2013; Paquette 2011; Sheliakin 2006; Stagg 2012a; Takeuchi 2012; Zimerman 2012), mainly because they were not RCTs, or because their outcomes did not measure function or activities of daily living (ADLs) (see Characteristics of excluded studies).

Risk of bias in included studies

We provided information about the risk of bias in Characteristics of included studies. To complete the rating of methodological quality, we contacted all principal investigators of the included

trials and of trials awaiting classification to request further information about methodological issues, if necessary. We made contact via letter and email, including email reminders once a month if we received no response. Some trialists provided all requested information, and some did not answer our requests. We used the 'Risk of bias' tool, as implemented in Review Manager 5, to assess risk of bias according to the aspects listed under Methods. Two review authors (BE and JM) independently assessed risk of bias of the included trials, and two other review authors (JK and MP) checked the extracted data for agreement. All review authors discussed disagreements and, if necessary, sought arbitration by another review author. A detailed description of risk of bias can be found in Characteristics of included studies. Information on risk of bias on study level and outcome level is provided in Figure 2 and in Figure 3.

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

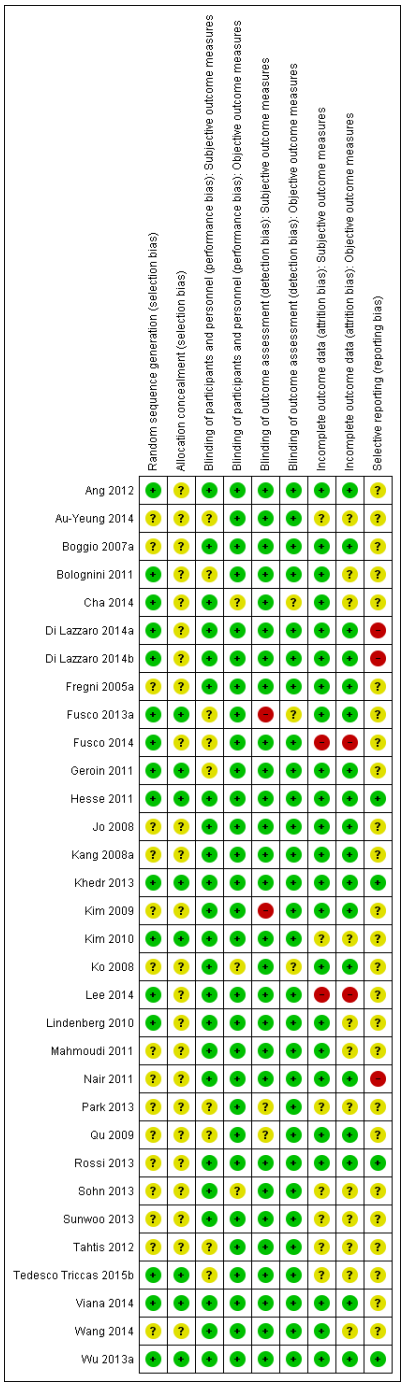
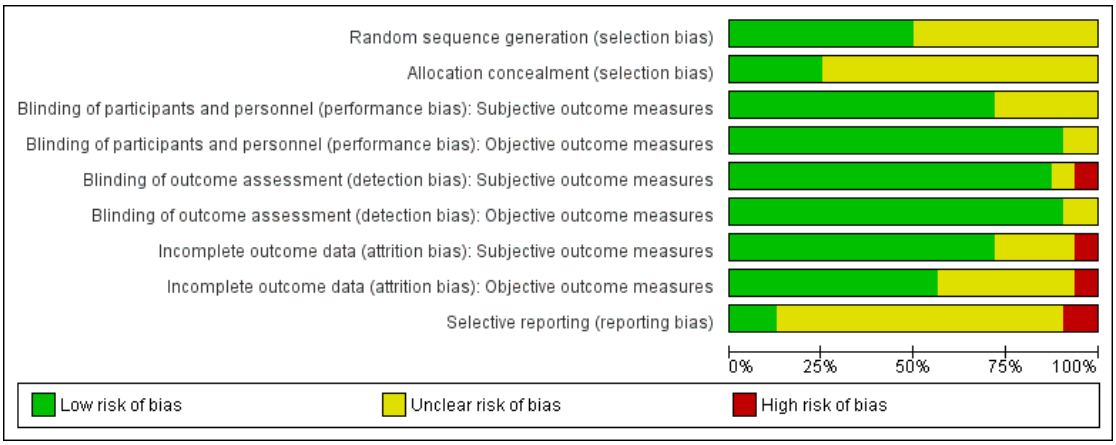


Figure 3. Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.



Allocation

Sixteen of the 32 included studies (50%) described a low risk of bias for sequence generation, whereas eight studies (25%) described a low risk of bias for allocation concealment.

Blinding

Twenty-three of the 32 included studies (72%) described low risk of bias for blinding of participants and personnel for subjective outcomes and 29 studies (91%) for objective outcomes, respectively. Twenty-eight studies (88%) described low risk of bias for blinding of outcome assessment for subjective and objective outcomes, whereas two studies were determined to have high risk of bias (Fusco 2013a; Kim 2009).

Incomplete outcome data

Twenty-three of the 32 included studies (72%) were at low risk of bias for incomplete outcome data for subjective outcomes, whereas 18 (56%) were at low risk of bias for subjective outcomes, and one was at high risk of bias (Kim 2010).

Selective reporting

Four of the 32 included studies (13%) were at low risk of bias for selective outcome reporting (Hesse 2011; Khedr 2013; Rossi 2013; Wu 2013a), and three studies (9%) were at high risk (Di Lazzaro 2014a; Di Lazzaro 2014b; Nair 2011).

Effects of interventions

See: **Summary of findings for the main comparison** tDCS versus any type of placebo or passive control intervention for improving function, and activities of daily living, cognitive abilities and neglect in people after stroke; **Summary of findings 2** tDCS versus any type of active control intervention for improving function, activities of daily living, cognitive abilities and neglect in people after stroke

Twenty-three of the 32 included studies (72%) were included within the meta-analysis (Ang 2012; Boggio 2007a; Bolognini 2011; Cha 2014; Di Lazzaro 2014a; Di Lazzaro 2014b; Fusco 2013a; Fusco 2014; Geroin 2011; Hesse 2011; Khedr 2013; Kim 2010; Lee 2014; Lindenberg 2010; Nair 2011; Park 2013; Qu 2009; Rossi 2013; Tahtis 2012; Tedesco Triccas 2015b; Viana 2014; Wang 2014; Wu 2013a).

Comparison 1. tDCS versus any type of placebo or passive control intervention

Comparison 1.1 Primary outcome measure: ADLs at the end of the intervention period

1.1.1 Studies presenting absolute values

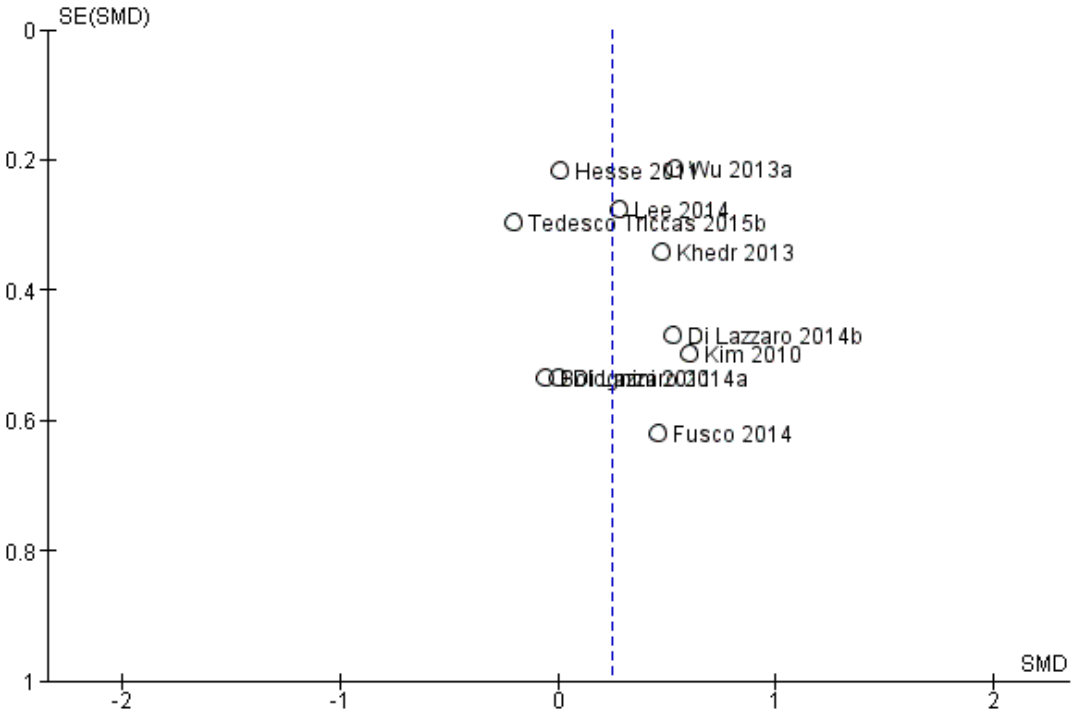
We found nine studies with 396 participants examining the effects of tDCS on ADLs (Bolognini 2011; Di Lazzaro 2014a; Di Lazzaro 2014b; Hesse 2011; Khedr 2013; Kim 2010; Lee 2014; Tedesco Triccas 2015b; Wu 2013a). We found evidence of effect regarding ADL performance when we analysed the data with combined intervention groups, as stated in Methods (i.e. A-tDCS and/or C-tDCS versus sham tDCS; standardised mean difference (SMD) 0.24, 95% confidence interval (CI) 0.03 to 0.44; inverse variance method with random-effects model; moderate quality evidence; Analysis 1.1; Summary of findings for the main comparison).

1.1.2 Studies presenting change scores

One study with 11 participants reported the effects of tDCS on ADLs as change values relative to baseline (Fusco 2014). There is very low quality evidence that there is no evidence of an effect (SMD 0.46, 95% CI -0.75 to 1.67; inverse variance method with random-effects model; very low quality evidence; Analysis 1.1; Summary of findings for the main comparison).

The funnel plot of Analysis 1.1 can be found in Figure 4. By visual inspection, we concluded that there were no indications of funnel plot asymmetry indicating a small-study effect or publication bias.

Figure 4. Funnel plot of comparison: 1 Primary outcome measure: tDCS for improvement of ADLs versus any type of placebo or control intervention, outcome: 1.1 ADLs at the end of the intervention period, absolute values (BI points).



Comparison 1.2 Primary outcome measure: ADLs until the end of follow-up, absolute values (at least three months after the end of the intervention period)

We included six studies with 269 participants (Di Lazzaro 2014b; Hesse 2011; Khedr 2013; Kim 2010; Rossi 2013; Tedesco Triccas 2015b); investigators measured the effects of tDCS on ADLs at the end of follow-up. We found evidence of effect regarding ADL performance when we analysed the data with combined intervention groups (SMD 0.31, 95% CI 0.01 to 0.62; inverse variance method with random-effects model; moderate quality evidence; Analysis 1.2; Summary of findings for the main comparison).

Because there were less than 10 included studies in this comparison, we omitted the visual inspection of the funnel plot of this

comparison.

Comparison 1.3 Secondary outcome measure: upper extremity function at the end of the intervention period

1.3.1 Studies presenting absolute values

Twelve trials with a total of 431 participants examined upper limb function at the end of the intervention period and provided absolute values for the outcome (Bolognini 2011; Di Lazzaro 2014a; Di Lazzaro 2014b; Fusco 2013a; Hesse 2011; Kim 2010; Lee 2014; Lindenberg 2010; Rossi 2013; Tedesco Triccas 2015b; Viana 2014; Wu 2013a). There was no evidence of effect of tDCS when we analysed the data with combined intervention groups (SMD 0.11, 95% CI -0.17 to 0.39; inverse variance method with random-effects model; low quality evidence; Analysis 1.3; Summary of findings for the main comparison).

1.3.2 Studies presenting change scores

We included four studies with 53 participants (Ang 2012; Fusco 2013a; Nair 2011; Wang 2014); investigators measured the effects of tDCS on upper limb function at the end of the intervention period and provided absolute values for the outcome. There was no evidence of effect of tDCS when we analysed the data with combined intervention groups (SMD 0.32, 95% CI -0.51 to 1.15; inverse variance method with random-effects model; low quality evidence; Analysis 1.3; Summary of findings for the main comparison).

Upon graphical inspection of the funnel plot of Analysis 1.3, we found no evidence of small-study effects.

Comparison 1.4 Secondary outcome measure: upper extremity function to the end of follow-up (at least three months after the end of the intervention period)

1.4.1 Studies presenting absolute values

Four studies with a total of 187 participants examined upper extremity function at the end of follow-up and reported absolute values for this outcome (Di Lazzaro 2014b; Hesse 2011; Rossi 2013; Tedesco Triccas 2015b). We found no evidence of effect regarding upper extremity function when we analysed the data with combined intervention groups (i.e. A-tDCS and/or C-tDCS versus sham tDCS; SMD 0.01, 95% CI -0.48 to 0.50; inverse variance method with random-effects model; low quality evidence; Analysis 1.4; Summary of findings for the main comparison).

1.4.2 Studies presenting change scores

We included one study with 18 participants (Kim 2010); the investigators measured the effects of tDCS on upper limb function at the end of follow-up and provided change values for the outcome. There was evidence of effect of tDCS when we analysed the data with combined intervention groups (SMD 1.49, 95% CI 0.40 to 2.59; inverse variance method with random-effects model; low quality evidence; Analysis 1.4).

Because there were less than 10 included studies in this comparison, we omitted the visual inspection of the funnel plot of this comparison.

Comparison 1.5 Secondary outcome measure: lower extremity function at the end of the intervention period

1.5.1 Studies presenting absolute values

Two studies with a total of 50 participants examined lower extremity function at the end of the intervention period and reported absolute values for this outcome (Cha 2014; Geroin 2011). We found no evidence of effect regarding lower extremity function when we analysed the data with combined intervention groups (i.e. A-tDCS and/or C-tDCS versus sham tDCS; SMD 0.20, 95% CI -1.26 to 1.67; inverse variance method with random-effects model; low quality evidence; Analysis 1.5).

1.5.2 Studies presenting change scores

Two studies with a total of 25 participants examined lower extremity function at the end of the intervention period and reported change values for this outcome (Fusco 2014; Tahtis 2012). We found no evidence of effect regarding lower extremity function when we analysed the data with combined intervention groups (i.e. A-tDCS and/or C-tDCS versus sham tDCS; SMD 0.81, 95% CI -0.02 to 1.65; inverse variance method with random-effects model; Analysis 1.5.

Because there were less than 10 included studies in this comparison, we omitted the visual inspection of the funnel plot of this comparison. We did not identify any study examining the effects of tDCS on lower extremity function at follow-up.

Comparison 1.6 Secondary outcome measure: muscle strength at the end of the intervention period

1.6.1 Studies presenting absolute values

We included eight studies with 272 participants (Bolognini 2011; Di Lazzaro 2014a; Di Lazzaro 2014b; Fusco 2013a; Hesse 2011; Khedr 2013; Lee 2014; Viana 2014); investigators measured the effects of tDCS on muscle strength at the end of the intervention

period and provided absolute values for the outcome. There was no evidence of effect of tDCS when we analysed the data with combined intervention groups (SMD 0.14, 95% CI -0.11 to 0.38; inverse variance method with random-effects model; Analysis 1.6).

1.6.2 Studies presenting change scores

Two studies with a total of 41 participants examined muscle strength at the end of the intervention period and reported change values for this outcome (Fusco 2014; Geroin 2011). We found no evidence of effect regarding muscle strength when we analysed the data with combined intervention groups (i.e. A-tDCS and/or C-tDCS versus sham tDCS; SMD 0.05, 95% CI -2.12 to 2.23; inverse variance method with random-effects model; Analysis 1.6). By visual inspection, the authors concluded that there were no indications of funnel plot asymmetry indicating a small-study effect or publication bias.

Comparison 1.7 Secondary outcome measure: muscle strength at the end of follow-up (at least three months after the end of the intervention period), absolute values

We included three studies with 156 participants (Di Lazzaro 2014b; Hesse 2011; Khedr 2013); investigators measured the effects of tDCS on muscle strength at the end of follow-up and provided absolute values for the outcome. There was no evidence of effect of tDCS when we analysed the data with combined intervention groups (SMD 0.07, 95% CI -0.26 to 0.41; inverse variance method with random-effects model; Analysis 1.7).

Because there were less than 10 included studies in this comparison, we omitted the visual inspection of the funnel plot of this comparison.

Comparison 1.8 Secondary outcome measure: cognitive abilities at the end of the intervention period

There was one study with eleven participants that examined the effects of tDCS on cognitive abilities (Park 2013). We did not perform statistical pooling. We identified three randomised cross-over trials that examined the effects of tDCS on cognitive abilities, but data extraction was not possible due to missing information regarding the first intervention period (Au-Yeung 2014; Jo 2008; Kang 2008a). However, each of the studies reported evidence of an effect in favour of tDCS regarding measures of attention. We did not identify any studies examining the effects of tDCS on cognitive abilities at follow-up.

Empty comparison: Secondary outcome measure: spatial neglect

We identified a randomised cross-over trial with 15 participants that examined the effects of tDCS on neglect, but data extraction was not possible due to missing information regarding the first intervention period (Ko 2008). This study reported significant improvement in neglect tests. We did not identify any randomised studies examining the effects of tDCS on spatial neglect at follow-up.

Comparison 1.9 Secondary outcome measure: dropouts, adverse events and deaths during the intervention period

Twenty-two out of 32 studies (69%) reported data on dropouts, and 13 out of 32 studies (41%) reported data on adverse events. In six of 23 studies (26%), dropouts, adverse events or deaths that occurred during the intervention period were reported (Bolognini 2011; Fusco 2014; Hesse 2011; Kim 2010; Lee 2014; Tedesco Triccas 2015b), whereas the remaining studies reported no dropouts, adverse events or deaths. We found no evidence of effect regarding differences in dropouts, adverse effects and deaths between intervention and control groups (risk difference (RD) 0.01, 95% CI -0.02 to 0.03; Mantel-Haenszel method with random-effects model; analysis based only on studies that reported either on dropouts or on adverse events or on both; low quality evidence; Analysis 1.9; Summary of findings for the main comparison). A detailed description of dropouts, adverse events and deaths during the intervention period can be found in Table 2.

Comparison 2. tDCS versus any type of active control intervention

Comparison 2.1 Primary outcome measure: ADLs at the end of the intervention period, absolute values

There was one study with 50 participants that examined the effects of tDCS on ADLs at the end of the intervention period and provided absolute values on this outcome (Qu 2009). This study did not show any evidence of effect of tDCS on ADLs at the end of the intervention period. We did not identify any study examining the effects of tDCS versus any type of active control intervention on ADLs at follow-up. We gave a GRADE rating of very low quality evidence (Summary of findings 2).

Comparison 2.2 Secondary outcome measure: upper extremity function at the end of the intervention period

There was one study with 20 participants that examined the effects of tDCS on upper extremity function at the end of the intervention period (Cha 2014). This study reported evidence of effect of tDCS on upper extremity function at the end of the intervention period. We did not identify any study examining the effects of tDCS versus any type of active control intervention on upper extremity function at follow-up. We gave a GRADE rating of low quality evidence (Summary of findings 2).

Comparison 2.3 Secondary outcome measure: upper extremity function at the end of the intervention period

There was one study with 20 participants that examined the effects of tDCS on lower extremity function at the end of the intervention period (Cha 2014). This study reported evidence of effect of tDCS on lower extremity function at the end of the intervention period. We could not identify any study examining the effects of tDCS versus any type of active control intervention on lower extremity function at follow-up. We gave a GRADE rating of low quality evidence (Summary of findings 2).

Comparison 2.4 Secondary outcome measure: dropouts, adverse events and deaths during the intervention period

Neither of the two included studies reported dropouts, adverse events, or deaths that occurred during the intervention period (Cha 2014; Qu 2009). We found no evidence of effect regarding differences in dropouts, adverse effects and deaths between intervention and control groups (RD 0.00, 95% CI -0.07 to 0.07; Mantel-Haenszel method with random-effects model; analysis based only on studies which reported either on dropouts or on adverse events or on both; Analysis 2.4).

Comparison 3. Subgroup analyses

Outcome 3.1. Planned analysis: duration of illness - acute/subacute versus postacute versus chronic phase for ADLs at the end of the intervention period

In a planned subgroup analysis, we analysed the effects of tDCS on the primary outcome of ADLs in the acute/subacute and postacute phases (Analysis 3.1). We found no evidence for different effects of tDCS between subgroups $Chi^2 = 1.06$, df = 2 (P = 0.59), $I^2 = 0\%$.

Subgroup 3.1.1 Acute/subacute phase (the first week after stroke and the second to the fourth week after stroke)

We included four studies with 213 participants (Hesse 2011; Khedr 2013; Kim 2010; Lee 2014). We found no evidence of effect regarding differences in ADL performance between intervention and control groups when we analysed the data with combined intervention groups, as stated in the protocol (i.e. A-tDCS or C-tDCS or dual-tDCS versus sham tDCS; SMD 0.22, 95% CI -0.07 to 0.51; inverse variance method with random-effects model).

Subgroup 3.1.2 Postacute phase (from the first to the sixth month after stroke)

We included two studies with 140 participants (Qu 2009; Wu 2013a). We found evidence of differences in effect of tDCS regarding ADL performance between tDCS- and control groups when we analysed the data with combined intervention groups, as stated in the protocol (i.e. A-tDCS or C-tDCS or dual-tDCS versus sham tDCS; SMD 0.30, 95% CI -0.22 to 0.82; inverse variance method with random-effects model).

Subgroup 3.1.2 Chronic phase (from the sixth month after stroke)

We included four studies with 93 participants (Bolognini 2011; Di Lazzaro 2014a; Di Lazzaro 2014b; Tedesco Triccas 2015b). We found no evidence of effect regarding differences in ADL performance between intervention and control groups when we analysed the data with combined intervention groups, as stated in the protocol (i.e. A-tDCS or C-tDCS or dual-tDCS versus sham tDCS; SMD -0.01, 95% CI -0.41 to 0.40); inverse variance method with random-effects model).

Outcome 3.2. Planned analysis: effects of type of stimulation (A-tDCS/C-tDCS/dual-tDCS) and location of stimulation (lesioned/non-lesioned hemisphere) on ADLs at the end of the intervention period

We performed a planned subgroup analysis regarding the location of electrode positioning and hence of stimulation (Analysis 3.2). No studies investigated the effects of A-tDCS over the non-lesioned hemisphere. We found no evidence of differences in effects of location and type of stimulation regarding ADL performance between subgroups ($Chi^2 = 0.67$, df = 2 (P = 0.72), $I^2 = 0\%$).

Subgroup 3.2.1 A-tDCS over the lesioned hemisphere

We included five studies with 164 participants (Bolognini 2011; Hesse 2011; Khedr 2013; Kim 2010; Tedesco Triccas 2015b). We found no evidence of differences in effects regarding ADL performance between A-tDCS and sham tDCS groups (SMD -0.04, 95% CI -0.35 to 0.27; inverse variance method with random-effects model).

Subgroup 3.2.2 C-tDCS over the non-lesioned hemisphere

We included six studies with 301 participants (Hesse 2011; Khedr 2013; Kim 2010; Lee 2014; Qu 2009; Wu 2013a). We found evidence of differences in effect regarding ADL performance between C-tDCS and the sham tDCS groups, but the confidence intervals were wide (SMD 0.33, 95% CI 0.10 to 0.57; inverse variance method with random-effects model).

Subgroup 3.2.3 Dual-tDCS (A-tDCS over the lesioned and C-tDCS over the non-lesioned hemisphere)

We included two studies with 33 participants (Di Lazzaro 2014a; Di Lazzaro 2014b). We did not find evidence of differences in effect regarding ADL performance between dual-tDCS and sham

tDCS groups (SMD 0.30, 95% CI -0.39 to 0.99; inverse variance method with random-effects model).

Outcome 3.3. Planned sensitivity analysis regarding types of control interventions (sham tDCS/conventional therapy/no intervention)

Eight studies with 337 participants comparing active tDCS versus sham tDCS revealed evidence of an effect in favour of active tDCS (SMD 0.23, 95% CI 0.01 to 0.46; inverse variance method with random-effects model; Analysis 3.3). Two studies with 109 participants comparing active tDCS versus active control interventions did not reveal evidence of an effect (SMD 0.14, 95% CI -0.24 to 0.53; inverse variance method with random-effects model; Analysis 3.3). The subgroups did not differ statistically significantly (test for subgroup differences: $Chi^2 = 0.14$, df = 1 (P = 0.71), $I^2 = 0\%$).

Sensitivity analyses

We conducted a sensitivity analysis of methodological quality to test the robustness of our results. We repeated the analysis of our primary outcome, ADL performance at the end of the intervention period and at the end of follow-up, and considered only studies with correctly concealed allocation, blinding of assessors and ITT. The evidence of an effect of tDCS disappeared when we analysed only those studies with correct allocation concealment. See Table 3 and Table 4.

ADDITIONAL SUMMARY OF FINDINGS [Explanation]

tDCS versus any type of active control intervention for improving function activities of daily living, cognitive abilities and neglect in people after stroke

Patient or population: people with improving function, activities of daily living, cognitive abilities and neglect after stroke
Settings: unspecified
Intervention: tDCS versus any type of active control intervention

Outcomes	Illustrative comparative risks* (95% CI) Corresponding risk tDCS versus any type of active control intervention	No. of participants (studies)	Quality of the evidence (GRADE)	Comments
Primary outcome measure: ADLs at the end of the intervention period**, absolute values** Measures of activities of daily living. Scale from: 0 to 100	The mean primary outcome measure: ADLs at the end of the intervention period, absolute values in the intervention groups was **0 higher** (10.04 lower to 10.04 higher)	50 (1 study)	⊕◯◯◯ **very low**[1,2,3]	
Secondary outcome measure: upper extremity function at the end of the intervention period Clinical measures of upper extremity function. Scale from: 0 to 66	The mean secondary outcome measure: upper extremity function at the end of the intervention period in the intervention groups was **19 higher** (9.38 to 28.62 higher)	20 (1 study)	⊕⊕◯◯ **low**[1,2]	
Secondary outcome measure: lower extremity function at the end of the intervention period Clinical measures of lower extremity function. Scale from: 0 to 34	The mean secondary outcome measure: lower extremity function at the end of the intervention period in the intervention groups was **5.3 higher** (0.75 to 9.85 higher)	20 (1 study)	⊕⊕◯◯ **low**[1,2]	

Secondary outcome measure: dropouts, adverse events and deaths during the intervention period Adverse events, dropouts and deaths during the intervention period	**Study population**		See comment	70 (2 studies)	See comment	Risks were calculated from pooled risk differences
	See comment	See comment				
	Moderate					
	0 per 1000	**-2147483648 per 1000** (-2147483648 to -2147483648)				

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (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).
ADL: activities of daily living; **CI:** Confidence interval; tDCS: transcranial direct current stimulation

GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

[1] Downgraded due to several ratings with 'unclear' or 'high' risk of bias.
[2] Downgraded due to total sample size being less than 400 (as a rule of thumb).
[3] Downgraded because 95% CI contains effect size of no difference and the minimal important difference.

DISCUSSION

Summary of main results

This review focused on evaluating the effectiveness of transcranial direct current stimulation (tDCS) (anodal stimulation (A-tDCS)/ cathodal stimulation (C-tDCS)/(anodal plus cathodal stimulation simultaneously (dual-tDCS)) versus any passive control intervention (sham tDCS or no intervention) and tDCS versus any active control intervention (any other approach) for improving activities of daily living (ADLs), arm and leg function, muscle strength and cognitive abilities (including spatial neglect), dropouts and adverse events in people after stroke. We included 32 trials with a total of 748 participants.

Comparison 1: tDCS versus any type of placebo or passive control intervention

We found nine studies with 396 participants examining the effects of tDCS on our primary outcome measure, ADLs, after stroke. In addition to these studies presenting absolute values of the outcome, we found one study with 11 participants, presenting change values for the outcome. We found evidence of effect regarding ADL performance at the end of the intervention period for nine studies presenting absolute values (standardised mean difference (SMD) 0.24, 95% confidence interval (CI) 0.03 to 0.44; inverse variance method with random-effects model). The funnel plot shows no evidence of a small-study effect. Six studies with 269 participants assessed the effects of tDCS on ADLs at the end of follow-up. Evidence suggested an effect regarding ADL performance (SMD 0.31, 95% CI 0.01 to 0.62; inverse variance method with random-effects model). However, this effect was not sustained when including only studies with adequate allocation concealment (Table 3; Table 4).

One of our secondary outcome measures was upper extremity function: 12 trials with a total of 431 participants measured upper extremity function at the end of the intervention period, revealing no evidence of an effect in favour of tDCS (SMD 0.01, 95% CI -0.48 to 0.50 for studies presenting absolute values, and SMD 0.32, 95% CI -0.51 to 1.15 for studies presenting change values; inverse variance method with random-effects model). Regarding the effects of tDCS on upper extremity function at the end of follow-up, we identified four studies with a total of 187 participants (absolute values) that showed no evidence of an effect (SMD 0.01, 95% CI -0.48 to 0.50; inverse variance method with random-effects model). Four studies with 75 participants examined the effect of tDCS on lower extremity function, but did not show evidence of an effect. Ten studies with 313 participants reported outcome data for muscle strength at the end of the intervention period, but in the corresponding meta-analysis there was no evidence of an effect. Three studies with 156 participants reported outcome data on muscle strength at follow-up, but there was no evidence of an effect. Four studies with 41 participants examined the effects of tDCS on cognitive abilities (including spatial neglect), however, statistical pooling was not possible due to missing information (three out of the four studies reported evidence of an effect). We identified a randomised cross-over trial with 15 participants that examined the effects of tDCS on neglect (which reported evidence of an effect of tDCS on neglect).

Twenty-two out of 32 studies (69%) reported data on dropouts and 13 out of 32 studies (41%) have reported data on adverse events. In six of 23 studies (26%), dropouts, adverse events or deaths occurred during the intervention period. We found no evidence of an effect regarding differences in dropouts, adverse effects and deaths between intervention and control groups (risk difference (RD) 0.03, 95% CI -0.01 to 0.06; Mantel-Haenszel method with random-effects model; analysis based only on studies that reported either on dropouts or on adverse events or on both).

A summary of this review's main findings can be found in Summary of findings for the main comparison.

Comparison 2: tDCS versus any type of active control intervention

We identified two studies with 70 participants comparing active tDCS with an active control intervention (physiotherapy or virtual reality). A summary of this review's main findings can be found in Summary of findings 2.

Overall completeness and applicability of evidence

The results of this review appear seem to be generalisable to other settings in industrialised countries. However, some factors suggest uncertainty in generalisations. These include the following.

1. Most of the studies included participants with first-time ever stroke.
2. Most participants suffered from ischaemic stroke.

Hence, the results may be of limited applicability for people with recurrent and haemorrhagic strokes. Moreover, completeness of evidence is lacking regarding studies on the effects of tDCS on lower limb function, cognitive abilities (including spatial neglect), and the reporting of adverse events.

The physiological mechanisms of tDCS are not fully understood yet. Included studies are heterogeneous in terms of type, location and duration of stimulation, amount of direct current delivered, electrode size and positioning, and participants with cortical and subcortical stroke. For example, recent research suggests that the effectiveness of cathodal stimulation (C-tDCS) over the contralesional M1 depends on corticospinal tract integrity, thus implicating that this is not a "one size fits all" intervention (Byblow 2011). Hence, it could be that this heterogeneity - even in the absence of

excess statistical heterogeneity in our analyses - produces a false-negative finding (Antal 2015).

Twenty-two out of 32 studies (69%) reported data on dropouts, and 13 out of 32 studies (41%) reported data on adverse events. We therefore decided to include only studies that reported either on dropouts, or on adverse events, or on both, in our analyses of adverse events. However, it could be that the real risk of dropouts or adverse events is underestimated in our analysis, since the analysis could be prone to reporting bias.

Quality of the evidence

Based on our assessments of the quality of evidence provided in Summary of findings for the main comparison and Summary of findings 2, we downgraded risk of bias and the imprecision of effect estimates that included no difference in the comparators, and concurrently failed to exclude clinically unimportant differences between them. We also found heterogeneity regarding trial design (parallel-group or cross-over design, two or three intervention groups), therapy variables (type of stimulation, location of stimulation, dosage of stimulation) and participant characteristics (age, time poststroke, severity of stroke/initial functional impairment).

Potential biases in the review process

The methodological rigour of Cochrane reviews minimises bias during the process of conducting systematic reviews. However, some aspects of this review represent an 'open door' to bias, such as eliminating obviously irrelevant publications according to titles and abstracts on the determination of only one review author (BE). This encompasses the possibility of unintentionally ruling out relevant publications. Another possibility is that publication bias could have affected our results. With the funnel plot for our main outcome of ADLs (at the end of the intervention period) showing no asymmetry, a small-study effect or publication bias nevertheless could exist, resulting in overestimation of the effects (Figure 4) (Sterne 2011).

Another potential source for the introduction of bias is that two of the review authors (JM and MP) were involved in conducting and analysing the largest of the included trials (Hesse 2011). However, they did not participate in extracting outcome data and determining risk of bias of this trial. They were replaced by another review author (JK), so that the introduction of bias is unlikely in this case.

We had to exclude nine trials from quantitative synthesis (meta-analysis) because of missing information regarding treatment order (i.e. the first intervention period of the cross-over trial) (Au-Yeung 2014; Fregni 2005a; Jo 2008; Kang 2008a; Kim 2009; Ko 2008; Mahmoudi 2011; Sohn 2013; Sunwoo 2013). However, the results of these trials regarding upper and lower extremity function, cognitive abilities (including spatial neglect) are mostly consistent with the results of comparisons made in our meta-analyses, and it is therefore unlikely that the results of these studies would have substantially altered our results.

Agreements and disagreements with other studies or reviews

As far as we know, there are several systematic reviews on the effects of tDCS on function after stroke: Tedesco Triccas 2015a included genuine RCTs with multiple sessions of tDCS. They included nine studies with 371 participants and showed no evidence of effect at the end of the intervention period (SMD 0.11, 95% CI -0.17 to 0.38; inverse variance method with fixed-effect model) or at long-term follow-up (SMD 0.23, 95% CI -0.17 to 0.62; inverse variance method with fixed-effect model). These results are similar to the results of our analyses regarding the effects of tDCS (combined) on upper limb function.

Another systematic review of quasi-randomised and properly randomised controlled trials has examined the effects of A-tDCS on upper limb motor recovery in stroke patients (Butler 2013). The review authors included eight trials with 168 participants, and their analysis revealed evidence of an effect of tDCS on upper limb function (SMD 0.49, 95% CI 0.18 to 0.81), mainly measured by the Jebsen Taylor Hand Function Test (JTT).

In another systematic review on the effects of tDCS, Adeyemo 2012 included 50 non-randomised and RCTs with 1314 participants (1282 people with stroke and 32 healthy volunteers) on the pooled effects of tDCS and repetitive transcranial magnetic stimulation (rTMS) on motor outcomes after stroke. With their analysis based on change values they revealed an effect of SMD 0.59, 95% CI 0.42 to 0.76; inverse variance method with random-effects model). These results differ from the results of our analyses, maybe because of 1) the inclusion of non-randomised studies that tend to overestimate treatment effects (Higgins 2011a), and 2) the statistical pooling with trials examining the effects of rTMS on motor outcomes after stroke.

Two other systematic reviews included meta-analyses dealing with the topic of tDCS for improving function after stroke (Bastani 2012; Jacobson 2012). Bastani 2012 examined the effects of A-tDCS on cortical excitability (as measured by transcranial magnet stimulation (TMS)) and upper extremity function (mainly measured by JTT) in healthy volunteers and people with stroke. Their analysis of the effects of A-tDCS over the lesioned hemisphere, based mainly on results of randomised cross-over studies, yielded no evidence of effect (SMD 0.39, 95% CI -0.17 to 0.94; inverse variance method with fixed-effect model). Jacobson 2012, a review about the effects of A-tDCS and C-tDCS on healthy volunteers, stated that the anodal-excitation and cathodal-inhibition (AeCi) dichotomy is relatively consistent regarding the effects of tDCS on function in healthy volunteers. However, in our analysis on people with stroke, we found evidence of an effect of C-tDCS over the non-lesioned as well as over the lesioned hemisphere, which seems to be contradictory to the AeCi dichotomy for healthy volunteers,

but is in accordance with the findings of another trial, aimed at comparing the lesion- and stimulation-specific effects of tDCS in healthy volunteers and stroke patients (Suzuki 2012). However, we found no evidence of effect for A-tDCS over the lesioned hemisphere in our planned subgroup analysis, which is consistent with the findings of Bastani 2012, but not with the findings of Suzuki 2012. In contrast to that we found evidence of an effect of tDCS on ADLs for C-tDCS over the non-lesioned hemisphere, which in turn is consistent with the findings of Suzuki 2012. However, when compared with the subgroups, A-tDCS over the lesioned hemisphere and dual-tDCS, the subgroup C-tDCS over the non-lesioned hemisphere has the highest statistical power.

Another systematic review found evidence of an effect of tDCS on motor-evoked potentials (MEP), but not on physiologic parameters, which is not in accordance with our findings (Horvath 2015). Most of the published systematic reviews to date have focused on the effects of tDCS on function and ADLs. To our knowledge, our review, including 32 genuine RCTs with a total of 748 participants is the most comprehensive review about the effects of tDCS on ADLs, function, muscle strength and cognitive abilities (including spatial neglect) in stroke.

AUTHORS' CONCLUSIONS

Implications for practice

Currently, evidence of very low to moderate quality suggests that transcranial direct current stimulation (tDCS) (anodal stimulation (A-tDCS)/cathodal stimulation (C-tDCS)/(anodal plus cathodal stimulation simultaneously (dual-tDCS)) versus control (sham tDCS or any other approach or no intervention) might improve activities of daily living (ADLs) after stroke. Evidence of low quality suggests that there is no effect of tDCS on arm and leg function, muscle strength and cognitive abilities (including spatial neglect) in people after stroke. Evidence of low quality indicates that no effect regarding dropouts and adverse events can be seen between tDCS and control groups. However, this effect may be underestimated due to reporting bias.

Implications for research

Currently the quality of evidence is still of very low to moderate quality, but there are many ongoing randomised trials on this topic that could change the quality of evidence in the future. Future studies should focus on those who may benefit most from tDCS after stroke and include outcomes of upper and lower limb function, muscle strength and cognitive abilities (including spatial neglect). Furthermore, dropouts and adverse events should be routinely monitored and presented as secondary outcomes. Methodological quality of future studies, particularly in relation to allocation concealment and intention-to-treat analysis, needs to be improved, along with adhering to the CONSORT statement, particularly for reporting dropouts and adverse events. Information on treatment order in randomised cross-over trials also should be routinely presented in future publications.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

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

Ang 2012

Methods	Study design: RCT Number of dropouts: none Number of adverse effects: none (Ang 2015 [pers comm]) Deaths: none ITT: yes
Participants	Country: Singapore Sample size: 19 participants; mean age (SD) 54 (10) years; mean UE-FM (SD) 34 (8) Inclusion criteria: not explicitly stated Exclusion criteria: history of seizures; major depression; implants that interfered with tDCS; being able to operate an EEG-based motor imagery brain-computer interface (MI-BCI); further therapy aiming at improving function in the affected upper limb
Interventions	2 arms: 1. Dual-tDCS with the anode placed over M1 of the affected hemisphere and the cathode placed over M1 the unaffected hemisphere (1 mA for 20 minutes) followed by 8 minutes of evaluation and 60 minutes of therapy using EEG-based MI-BCI with robotic feedback with the MIT-Manus device 5 times a week for 2 weeks 2. Sham tDCS with the anode placed over M1 of the affected hemisphere and the cathode placed over M1 the unaffected hemisphere (1 mA for 30 seconds) followed by 8 minutes of evaluation and 60 minutes of therapy using EEG-based MI-BCI with robotic feedback with the MIT-Manus device 5 times a week for 2 weeks
Outcomes	Outcomes were measured at baseline, at the end of intervention period at 2 weeks and at 2 week follow-up: 1. UE-FM 2. Online MI-BCI performance 3. event-related desynchronisation laterality coefficient
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	People were randomised by "A randomization stratification generated using a computer-generated random sequence" (Ang 2015 [pers comm])
Allocation concealment (selection bias)	Unclear risk	Quote: "Interventions of the subjects were applied by an engineer and a research assistant respectively. For tDCS, the research assistant was the only person who knew the

Ang 2012 (*Continued*)

		randomization sequence for the subjects allocation" (Ang 2015 [pers comm])
Blinding of participants and personnel (performance bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Participants were blinded; personnel were not blinded (Ang 2015 [pers comm])
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Quote: "Yes, the outcome assessors for Fugl-Meyer were blinded to group allocation" (Ang 2015 [pers comm])
Incomplete outcome data (attrition bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Incomplete outcome data (attrition bias) Objective outcome measures	Low risk	All participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	Unclear risk	Not all of the secondary outcome measures listed in the published trial protocol have been reported, but will be presented in further publications (RMT of affected M1; grip strength; BBT; MRI parameters)

Au-Yeung 2014

Methods	Study design: randomised controlled cross-over trial Number of dropouts: none Number of adverse effects: not described Deaths: none ITT: yes
Participants	Country: China Sample size: 10 participants; mean age (SD) 63 (6) years; mean UE-FM (SD) 58 (8) Inclusion criteria: not explicitly stated; participants were recruited from a convenience sample from two patient self help groups for stroke; participants were < 80 years of age; had a single stroke more than a year prior to enrolment and had weakness in the affected upper limb and could perform a pincer grip with the index finger Exclusion criteria: not explicitly stated, but people excluded were either illiterate in

	Chinese, had a history of other neurologic disorders, metal in the head, musculoskeletal pathologies affecting movements in the upper limbs, had aphasia or < 18 points on the MMSE
Interventions	Each participant underwent all of the following conditions: 1. A-tDCS over M1 of the affected hemisphere (1 mA for 20 minutes) plus sham tDCS over M1 of the unaffected hemisphere (1 mA for 10 seconds) once 2. C-tDCS over M1 of the unaffected hemisphere (1 mA for 20 minutes) plus sham tDCS over M1 of the affected hemisphere (1 mA for 10 seconds) once 3. Sham tDCS over M1 of the unaffected hemisphere plus sham tDCS over M1 of the affected hemisphere (1 mA for 10 seconds) once
Outcomes	Outcomes were measured at baseline and at the end of intervention period Primary outcome measures: 1. Purdue pegboard test (hand dexterity) 2. Color-word Stroop test (selective attention) Secondary outcome measures: 1. Pinch grip strength (handheld digital dynamometer) 2. Fatigue (NRS)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Quote: "The sequence was determined in advance for each subject by drawing lots from an envelope"
Allocation concealment (selection bias)	Unclear risk	Quote: "The sequence was determined in advance for each subject by drawing lots from an envelope"
Blinding of participants and personnel (performance bias) Subjective outcome measures	Unclear risk	Participants were blinded, but personnel were not. Quote: "It was the third investigator (C.Y.) who set the tDCS parameters for both channels and operated the machine behind the subject throughout the experimental procedure"
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Participants were blinded, but personnel were not. Quote: "It was the third investigator (C.Y.) who set the tDCS parameters for both channels and operated the machine behind the subject throughout the experimental procedure"

Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	Outcome assessors were blinded. Quote: "Two other investigators (J.W. and E.C.) who were blinded to the allocated tDCS conditions then assessed the baseline motor status of the subjects' paretic upper limb"
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Outcome assessors were blinded. Quote: "Two other investigators (J.W. and E.C.) who were blinded to the allocated tDCS conditions then assessed the baseline motor status of the subjects' paretic upper limb"
Incomplete outcome data (attrition bias) Subjective outcome measures	Unclear risk	All participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Incomplete outcome data (attrition bias) Objective outcome measures	Unclear risk	All participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	Unclear risk	All outcomes reported in the methods section reported

Boggio 2007a

Methods	Study design: randomised sham-controlled cross-over trial Dropouts: none Adverse effects: none Deaths: none ITT: yes Duration: 16 weeks
Participants	Country: Brazil Number of participants: 4 Age: (mean ± SD) 60.75 ± 13.15 years Gender: 0 female Type of stroke: not described, most likely ischaemic stroke Time poststroke: (mean ± SD) 34.5 ± 27.74 months Severity: mean muscle strength of the finger flexors (MRC) 3.8; mean ASS 0.5 Inclusion criteria: not clearly stated, but all participants had chronic, subcortical stroke, were right-handed and had their stroke at least 12 months before study enrolment Exclusion criteria: not stated

Boggio 2007a (*Continued*)

Interventions	Characteristics: 4 weekly sessions of A-tDCS (1 mA) over the hand area of M1 of the lesioned hemisphere, or C-tDCS (1 mA) over the hand area of M1 of the non-lesioned hemisphere or sham tDCS over the hand area of M1 of the lesioned hemisphere for 20 minutes with at least 2 weeks of rest between stimulation conditions
Outcomes	Outcomes used: duration of JTT in seconds Time point(s) of measurement: at baseline, after the first and after the fourth session of each treatment condition
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Procedure not described, quote: "The order of these conditions was counterbalanced and randomised across subjects"
Allocation concealment (selection bias)	Unclear risk	Not described
Blinding of participants and personnel (performance bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Participants were blinded; blinding of personnel was not described
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Quote: "A blinded rater evaluated motor function using the Jebsen-Taylor Hand Function Test"
Incomplete outcome data (attrition bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Incomplete outcome data (attrition bias) Objective outcome measures	Low risk	All participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	Unclear risk	All outcomes reported in the methods section reported

Bolognini 2011

Methods	Study design: randomised controlled multicentre trial Dropouts: 7 Adverse effects: none Deaths: not stated ITT: no
Participants	Country: not stated Number of participants: 14 participants from the outpatient population of 3 neurological research units Age: (mean ± SD) 46.71 ± 14.08 years Gender: 9 female (64%) Type of stroke: 2 haemorrhagic (14%) Time poststroke: (mean ± SD) 35.21 ± 26.45 months Severity: moderate to severe hemiparesis, as indexed by UE-FM (mean score 26, range 8 to 50) Inclusion criteria: ischaemic or haemorrhagic first-ever stroke, stroke onset > 6 months before the study, functional inclusion criteria as defined by the EXCITE trial Exclusion criteria: pre stroke motor impairment affecting the upper limbs, moderate to severe major depression, previous CIMT and/or tDCS and contraindications regarding CIMT and/or tDCS
Interventions	Number of arms: 2 1. 14-day CIMT with shaping techniques + A-tDCS (2 mA, 40 minutes) over the lesioned primary motor cortex (M1) 2. 14-day CIMT with shaping techniques + sham tDCS (40 minutes) over the lesioned primary motor cortex (M1)
Outcomes	Outcomes used: 1. Motor assessments: duration of JTT in seconds, handgrip strength, MAL, UE-FM 2. Visual analogue scales for anxiety and pain/discomfort, questionnaire for adverse effects 3. Time point of measurement: day 1, day 5, day 10 (end of treatment) and at 2 and 4 weeks of follow-up
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated randomisation list (Bolognini 2013 [pers comm])
Allocation concealment (selection bias)	Unclear risk	The principal investigator, who took no part in data collection, nor in participants' evaluations, nor in treatment, knew the randomisation list and performed allocation (Bolognini 2013 [pers comm])

Blinding of participants and personnel (performance bias) Subjective outcome measures	Unclear risk	Participants were blinded; blinding of personnel was not described
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Participants were blinded; blinding of personnel was not described
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	Quote: "The assessment of motor functions and the administration of the functional scales and questionnaires were performed by a trained staff, blinded to group assignment"
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Quote: "The assessment of motor functions and the administration of the functional scales and questionnaires were performed by a trained staff, blinded to group assignment"
Incomplete outcome data (attrition bias) Subjective outcome measures	Low risk	Dropouts due to frustration and tiredness during assessment, quote: "Five patients (2 in the active group and 3 in the sham group) did not complete the JHFT. Two patients (1 in the active group and 1 in the sham group) did not complete the HS task. " These participants have been excluded from analysis and presentation of results"
Incomplete outcome data (attrition bias) Objective outcome measures	Unclear risk	Dropouts due to frustration and tiredness during assessment, quote: "Five patients (2 in the active group and 3 in the sham group) did not complete the JHFT. Two patients (1 in the active group and 1 in the sham group) did not complete the HS task. " These participants have been excluded from analysis and presentation of results"
Selective reporting (reporting bias)	Unclear risk	All outcomes reported in the methods section reported

Cha 2014

Methods	Study design: RCT Number of dropouts: none Number of adverse effects: not reported Deaths: none ITT: yes
Participants	Country: Republic of Korea Sample size: 20 (10 in experimental and 10 in control group) Inclusion criteria: hemiplegia due to stroke; gait disturbances Exclusion criteria: not stated
Interventions	2 arms: 1. A-tDCS 1 mA for 20 minutes over M1 of the lesioned hemisphere + functional training for 30 minutes daily, 5 days a week for 4 weeks 2. functional training for 30 minutes daily, 5 days a week for 4 weeks
Outcomes	Outcomes were measured at baseline and at the end of intervention period 1. Berg Balance Scale 2. Grip strength 3. Fugl-Meyer Assessment (Upper Extremity) 4. Fugl-Meyer Assessment (Lower Extremity) 5. Fugl-Meyer Assessment (Balance)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "The subjects were assigned to the treatment groups by having each of the subjects take out one card from a box containing two types of card representing both of the treatment groups"
Allocation concealment (selection bias)	Unclear risk	Not described by the authors
Blinding of participants and personnel (performance bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Blinding of participants and personnel (performance bias) Objective outcome measures	Unclear risk	Not described by the authors
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	There were no subjective outcome measures

Cha 2014 (*Continued*)

Blinding of outcome assessment (detection bias) Objective outcome measures	Unclear risk	Not described by the authors
Incomplete outcome data (attrition bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Incomplete outcome data (attrition bias) Objective outcome measures	Unclear risk	Not described by the authors
Selective reporting (reporting bias)	Unclear risk	All outcomes reported in the methods section reported

Di Lazzaro 2014a

Methods	Study design: RCT Number of dropouts: none Number of adverse effects: not reported Deaths: none ITT: yes
Participants	Country: Italy Sample size: 14 (7 in the experimental and 7 in the control group) Inclusion criteria: first ischaemic cerebral infarction confirmed by MRI; admitted to Stroke Unit; aged between 18 to 90 years; acute phase of stroke Exclusion criteria: prestroke disability; not understanding instructions for motor testing; excessive pain in any joint of the paretic limbs; contraindications to single-pulse TMS; advanced diseases of inner organs; concurrent neurologic or psychiatric diseases; history of substance abuse; use of neuropsychotropic drugs
Interventions	2 arms 1. Bilateral tDCS (anode over M1 of the lesioned hemisphere and cathode over M1 of the non-lesioned hemisphere, simultaneously) (2 mA for 40 minutes) for 5 continuous days 2. Sham tDCS (anode over M1 of the lesioned hemisphere and cathode over M1 of the non-lesioned hemisphere, simultaneously) (2 mA for 30 seconds) for 5 continuous days
Outcomes	Outcomes were measured at baseline and at the end of intervention period 1. Action Research Arm Test 2. 9 Hole Peg Test 3. Handgrip strength 4. Motor Activity Log Scale 5. National Institute of Health Stroke Scale 6. Modified Rankin Scale 7. Adverse event monitoring and reporting
Notes	

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "patients were randomized to real or sham tDCS treatment through a block randomization stratification approach"
Allocation concealment (selection bias)	Unclear risk	Not described by the authors
Blinding of participants and personnel (performance bias) Subjective outcome measures	Low risk	Participants and personnel were blinded; quote "The investigators who applied real/sham tDCS were kept blind to the intervention by using the pre-programmed stimulation mode in the stimulator settings"
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Participants and personnel were blinded; quote "The investigators who applied real/sham tDCS were kept blind to the intervention by using the pre-programmed stimulation mode in the stimulator settings"
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	Quote: "An evaluator, blinded to the treatment, assessed the effects of the intervention"
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Quote: "An evaluator, blinded to the treatment, assessed the effects of the intervention."
Incomplete outcome data (attrition bias) Subjective outcome measures	Low risk	All participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Incomplete outcome data (attrition bias) Objective outcome measures	Low risk	All participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	High risk	All outcomes listed in the methods section reported except 'Adverse events', which was not reported clearly

Di Lazzaro 2014b

Methods	Study design: RCT Number of dropouts: none Number of adverse effects: not reported Deaths: none ITT: yes
Participants	Country: Italy Sample size: 20 (10 in the experimental and 10 in the control group) Inclusion criteria: first ischaemic cerebral infarction confirmed by MRI; admitted to Stroke Unit; aged between 18 to 90 years; acute phase of stroke Exclusion criteria: prestroke disability; not understanding instructions for motor testing; excessive pain in any joint of the paretic limbs; contraindications to single-pulse TMS; advanced diseases of inner organs; concurrent neurologic or psychiatric diseases; history of substance abuse; use of neuropsychotrophic drugs
Interventions	2 arms 1. Bilateral tDCS (anode over M1 of the lesioned hemisphere and cathode over M1 of the non-lesioned hemisphere, simultaneously) (2 mA for 40 minutes) for 5 continuous days + Constraint Induced Movement Therapy (at least 90 % of waking hours) for 5 days 2. Sham tDCS (anode over M1 of the lesioned hemisphere and cathode over M1 of the non-lesioned hemisphere, simultaneously) (2 mA for 30 seconds) for 5 continuous days + Constraint Induced Movement Therapy (at least 90 % of waking hours) for 5 days
Outcomes	Outcomes were measured at baseline, at the end of intervention period and at 3-month follow-up 1. Action Research Arm Test 2. 9 Hole Peg Test 3. Handgrip strength 4. Motor Activity Log Scale 5. National Institute of Health Stroke Scale 6. Modified Rankin Scale 7. Adverse event monitoring and reporting 8. Motor cortex excitability of both hemispheres 9. Propensity of the motor cortex of the lesioned hemisphere to undergo LTP-like phenomena promoted by using intermittent theta burst stimulation (iTBS)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "patients were randomized to real or sham tDCS treatment through a block randomization stratification approach"
Allocation concealment (selection bias)	Unclear risk	Not described by the authors

Di Lazzaro 2014b (*Continued*)

Blinding of participants and personnel (performance bias) Subjective outcome measures	Low risk	Participants and personnel were blinded; quote "The investigators who applied real/sham tDCS were kept blind to the intervention by using the pre-programmed stimulation mode in the stimulator settings"
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Participants and personnel were blinded; quote "The investigators who applied real/sham tDCS were kept blind to the intervention by using the pre-programmed stimulation mode in the stimulator settings"
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	Quote: "An evaluator, blinded to the treatment, assessed the effects of the intervention"
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Quote: "An evaluator, blinded to the treatment, assessed the effects of the intervention"
Incomplete outcome data (attrition bias) Subjective outcome measures	Low risk	All participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Incomplete outcome data (attrition bias) Objective outcome measures	Low risk	All participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	High risk	All outcomes listed in the methods section reported except "Adverse events", which was not reported clearly

Fregni 2005a

Methods	Study design: randomised double-blind sham-controlled cross-over trial Dropouts: none Adverse effects: none Deaths: none ITT: yes
Participants	Country: not clearly stated Number of participants: 6 participants with chronic stroke neuroimaging-proofed diagnosis; all were right-handed and all had their strokes at least 12 months before the study Age: (mean ± SD) 53.7 ± 16.6 years Gender: 4 women (66%)

Fregni 2005a (*Continued*)

	Type of stroke: not stated Time poststroke: 27.1 months (range 12 to 72 months) Severity: motor strength (mean ± SD) 4.18 ± 0.37; ASS (mean ± SD) 0.83 ± 0.75 Inclusion criteria: not clearly stated Exclusion criteria: not clearly stated, but the authors referred to Hummel 2005, where the exclusion criteria were as follows: severe depression, history of severe alcohol or drug abuse, severe language disturbances, particularly of a receptive nature, or serious cognitive deficits (MMSE < 23/30 points)
Interventions	Characteristics: each participant underwent 3 different conditions for 20 minutes, separated by at least 48 hours of rest 1. A-tDCS of the lesioned hemisphere's M1 (1 mA). 2. C-tDCS of the non-lesioned hemisphere's M1 (1 mA). 3. Sham tDCS (electrode montage not stated by the authors).
Outcomes	Outcomes used: duration of JTT in seconds Time point of measurement: at baseline after familiarisation session, during stimulation and directly after stimulation
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Not described
Allocation concealment (selection bias)	Unclear risk	Not described
Blinding of participants and personnel (performance bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Participants were blinded; blinding of personnel was not described
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Outcome assessor was blinded; quote: "A blinded neuropsychologist-instructed not to communicate with the patient during the task-evaluated patients' performance"

Fregni 2005a (*Continued*)

Incomplete outcome data (attrition bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Incomplete outcome data (attrition bias) Objective outcome measures	Low risk	All participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	Unclear risk	All outcomes reported in the methods section reported

Fusco 2013a

Methods	Study design: double-blinded, sham-controlled, randomised cross-over study Dropouts: none Adverse effects: none Deaths: none ITT: yes
Participants	Country: Italy Number of participants: 9 Age (mean ± SD): 53.5 ± 20.7 years Gender: 4 (57%) female Type of stroke: 8 (89%) ischaemic, 1 (11%) haemorrhagic Time poststroke (mean ± SD): 28.3 ± 10.4 days Severity (mean ± SD): grip strength 17.83 ± 7.45 kg Inclusion criteria: cortical or subcortical first-ever stroke (radiologically confirmed), possibility to perform pinch/grip test Exclusion criteria: history of chronic disabling pathologies of the upper limb; spasticity; presence of pacemaker or severe cardiovascular conditions; a history of tumour, prior neurosurgical brain intervention, severe cardiovascular conditions (including the presence of a pacemaker), a diagnosis of epilepsy or major psychiatric disorders
Interventions	Each participant underwent 1 of the following different stimulation conditions in 2 consecutive sessions on 2 consecutive days in random order (sham tDCS was obligatory) 1. A-tDCS for 15 minutes at 1.5 mA over M1 of the lesioned hemisphere 2. C-tDCS for 15 minutes at 1.5 mA over M1 of the non-lesioned hemisphere 3. Dual-tDCS for 15 minutes at 1.5 mA, with the anode over M1 of the lesioned hemisphere and the cathode over M1 of the non-lesioned hemisphere 4. Sham tDCS (dosage and application not clearly stated, probably as in the other groups)
Outcomes	Outcomes were measured at baseline and at the end of intervention period 1. Nine-Hole Peg Test-index (quote: "9HPT-index=velocity LS/velocity HS100") 2. Maximum pinch and grasp force in kg (measured by specific dynamometers according to the Jamar method, with a higher value indicating greater pinch and grasp force) 3. Patient satisfaction as measured by the Quebec User Evaluation of Satisfaction

	with Assistive Technology	
Notes		
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "For the random sequence generation, we used the RAND function in Matlab"
Allocation concealment (selection bias)	Low risk	Quote: "Specifically, patients were asked to take a sealed envelope from a box, containing a piece of paper with the assignment, which was concealed until the envelope was opened"
Blinding of participants and personnel (performance bias) Subjective outcome measures	Unclear risk	Quote: "Patients were blinded while physicians and assessors knew the treatment (real or sham)"
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Quote: "Patients were blinded while physicians and assessors knew the treatment (real or sham)"
Blinding of outcome assessment (detection bias) Subjective outcome measures	High risk	Quote: "Patients were blinded while physicians and assessors knew the treatment (real or sham)"
Blinding of outcome assessment (detection bias) Objective outcome measures	Unclear risk	Quote: "Patients were blinded while physicians and assessors knew the treatment (real or sham)"
Incomplete outcome data (attrition bias) Subjective outcome measures	Low risk	All participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Incomplete outcome data (attrition bias) Objective outcome measures	Low risk	All participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	Unclear risk	All outcomes reported in the methods section reported

Fusco 2014

Methods	Method: RCT Number of dropouts: 3 (2 (14%) in the experimental group, 1 (7%) in the control group) Number of adverse effects: not reported Deaths: not described ITT: no
Participants	Country: Italy Sample size: 11 participants (5 in the experimental and 6 in the control group) Inclusion criteria: admission to stroke unit; age between 18 and 83 years; ischaemic stroke in the MCA area confirmed by MRI or CT; time since stroke less than 30 days; no history of severe cognitive impairment; written informed consent Exclusion criteria: inability to perform a motor rehabilitation training; haemorrhagic stroke or multiple foci of ischaemia; previous stroke; diagnosis of major psychiatric disorders; epilepsy; history of tumour; pacemaker; uncontrolled arrhythmias; non-stabilised heart diseases; dementia or severe aphasia
Interventions	2 arms 1. C-tDCS (1.5 mA for 10 minutes) over M1 of the unaffected hemisphere on 5 consecutive days each week for 2 weeks prior to a rehabilitative session 2. Sham tDCS (not described) over M1 of the unaffected hemisphere on 5 consecutive days each week for 2 weeks prior to a rehabilitative session
Outcomes	Outcomes were measured at baseline, after the end of intervention period, 1 month after the intervention period and at the end of inpatient rehabilitation (75 to 110 days) 1. Canadian Neurological Scale 2. Barthel Index 3. 9-hole peg test 4. Grasp and pinch force 5. Upper extremity Fugl-Meyer Assessment 6. Timed Up and Go Test 7. 6-Minute Walking Test 8. 10-Meter Walking Test 9. Rivermead Mobility Index 10. Functional Ambulation Categories
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "The randomization was created in accordance with a binary sequence previously generated using MATLAB R2007b Software (TheMatworks Inc., USA)"
Allocation concealment (selection bias)	Unclear risk	Not described by the authors

Fusco 2014 (*Continued*)

Blinding of participants and personnel (performance bias) Subjective outcome measures	Unclear risk	Quote: "The patient was blind to the type of stimulation. An unblinded investigator administered the stimulation"
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Quote: "The patient was blind to the type of stimulation. An unblinded investigator administered the stimulation"
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	Quote: "The patient was blind to the type of stimulation, as well as the physician performing the assessments"
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Quote: "The patient was blind to the type of stimulation, as well as the physician performing the assessments"
Incomplete outcome data (attrition bias) Subjective outcome measures	High risk	Quote: "Two patients of EG dropped out from the study (one at the first and the other one at the second session). Also one patient of control group dropped out for an emergency transfer to another hospital." These participants have not been analysed
Incomplete outcome data (attrition bias) Objective outcome measures	High risk	Quote: "Two patients of EG dropped out from the study (one at the first and the other one at the second session). Also one patient of control group dropped out for an emergency transfer to another hospital." These participants have not been analysed
Selective reporting (reporting bias)	Unclear risk	All outcomes reported in the methods section reported

Geroin 2011

Methods	Study design: pilot RCT Dropouts: none Adverse effects: none Deaths: none ITT: yes
Participants	Country: Italy Number of participants: 30 outpatients Age: (mean ± SD) 62.7 ± 6.4 years Gender: 7 females (23%) Type of stroke: unilateral ischaemic stroke Time poststroke: (mean ± SD) 26.4 ± 5.5 months Severity: mean ESS score 79.93 (minimum score: 0, maximum score: 100; a completely

	healthy person would have a score of 100) Inclusion criteria: at least 12 months from first unilateral ischaemic stroke, age < 75 years, ESS score ≥ 75 and ≤ 85, MMSE-score ≥ 24, ability to maintain standing position without aid for at least 5 minutes, ability to walk independently for at least 15 minutes with the use of walking aids Exclusion criteria: history of seizures, EEG suspect of elevated cortical excitability, metallic implants within the brain and previous brain neurosurgery, medications altering cortical excitability or with a presumed effect of brain plasticity, posterior circulation stroke, deficits of somatic sensations involving the paretic lower limb, presence of vestibular disorders/paroxysmal vertigo, severe cognitive or communicative disorders, cardiovascular comorbidity, rehabilitation treatment 3 months before study enrolment
Interventions	Number of arms: 3; all participants underwent 50-minute training sessions 5 times a week for 2 consecutive weeks and 1 of the following interventions 1. Robot-assisted gait training + A-tDCS of the lesioned hemisphere over the presumed leg area (1.5 mA for 7 minutes) 2. Robot-assisted gait training + sham tDCS of the lesioned hemisphere over the presumed leg area (for 7 minutes) 3. Overground walking exercises according to the Bobath approach
Outcomes	Primary outcomes: six-minute walking test, 10-metre walking test Secondary outcomes: GAITRite system, FAC, RMI, MI leg subscore and MAS Time point of measurement: at baseline, after treatment and at two weeks follow-up
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "After baseline evaluation, patients were allocated to one of three treatment groups according to a simple software-generated randomisation scheme"
Allocation concealment (selection bias)	Low risk	Quote: "We allocated patients to one of the three treatment arms according to a restricted randomisation scheme. One of the investigators checked correct patient allocation according to the randomisation list. After unmasking at the end of the study, we checked that no errors had been made in allocation" (Smania 2013 [pers comm])
Blinding of participants and personnel (performance bias) Subjective outcome measures	Unclear risk	Quote: "Asking the assessor to make an educated guess tested the success of blinding. The therapists were aware of the type of treatment received by the patients. Patients were aware of the type of treatment who un-

Geroin 2011 (*Continued*)

		derwent but they were not aware about the type of stimulation (Group 1 stimulation vs Group 2 sham stimulation)" (Smania 2013 [pers comm])
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Quote: "Asking the assessor to make an educated guess tested the success of blinding. The therapists were aware of the type of treatment received by the patients. Patients were aware of the type of treatment who underwent but they were not aware about the type of stimulation (Group 1 stimulation vs Group 2 sham stimulation)" (Smania 2013 [pers comm])
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	Quote: "All patients were evaluated by the same examiner (an experienced internal coworker) who was not aware of the treatment received by the patients"
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Quote: "All patients were evaluated by the same examiner (an experienced internal coworker) who was not aware of the treatment received by the patients"
Incomplete outcome data (attrition bias) Subjective outcome measures	Low risk	All participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Incomplete outcome data (attrition bias) Objective outcome measures	Low risk	All participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	Unclear risk	All outcomes stated in the methods section were reported, except muscle tone as measured by MAS

Hesse 2011

Methods	Study design: double-blind randomised sham-controlled multicentre trial Dropouts: 11 (11%) Adverse effects: none Deaths: 2 (2%) due to heart infarction and during stent surgery ITT: yes, 85 participants completed the study (89%)

Participants	Country: Germany/Italy Number of participants: 96 stroke participants from 3 study centres Mean age: 65.0, range 39 to 79 years Gender: 37 female (39%) Type of stroke: all ischaemic, 45 of 96 (47%) right-hemispheric stroke Time poststroke: (mean ± SD) A-tDCS group: 3.4 ± 1.8 weeks; C-tDCS group: 3.8 ± 1.4 weeks; sham tDCS group: 3.8 ± 1.5 weeks Severity: at least wheelchair-mobile participants, who had severe flaccid upper limb paresis with no (MRC 0) or minimal (MRC 1) volitional hand and finger extensor activity. 24 had an upper limb UE-FM (range 0 to 66) < 18 and were unable to transfer 3 wooden blocks from 1 compartment to the other in the Box and Block test Inclusion criteria: age 18 to 79 years, first supratentorial ischaemic stroke with a stroke interval of 3 to 8 weeks' duration, and with participation in a comprehensive inpatient rehabilitation programme Exclusion criteria: history of epileptic seizures, EEG suspect of elevated cortical excitability, metallic implants in the brain, preceding brain surgery, sensitive scalp skin, anticonvulsant or neuroleptic medications
Interventions	Number of arms: 3; each participant practiced for 6 weeks every working day for 20 minutes with the arm robot (AT) and simultaneously received one of the following interventions: 1. A-tDCS (2 mA) with the anode positioned over the presumed hand area of the lesioned hemisphere 2. C-tDCS (2 mA) with the cathode positioned over the presumed hand area of the non-lesioned hemisphere 3. Sham tDCS (0 mA) with consecutive changing of the positions of arms (1) and (2)
Outcomes	Primary outcome: sensory and motor integrity, degree of synergy as assessed by UE-FM assessment score (0 to 66, 0 = no movement, 66 = full motion) Secondary outcomes: upper limb muscle strength (MRC; 0 to 5, 0 = plegic, 5 = full power), muscle tone (MAS; 0 to 5, 0 = no increase, 5 = affected part rigid in flexion or extension), BI, upper limb function (as assessed by Box and Block test, the transfer of as many wooden blocks as possible with the affected hand from 1 compartment to the other within 1 minute, with a high value indicating good function) Time point of measurement: study onset, end of the 6-week intervention and 3 months of follow-up
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Following a telephone call, an independent person randomly allocated eligible patients to 1 of the 3 groups by drawing a lot out of an envelope containing 96 lots, indicating A, B, and C"

Allocation concealment (selection bias)	Low risk	Quote: "Following a telephone call, an independent person randomly allocated eligible patients to 1 of the 3 groups by drawing a lot out of an envelope containing 96 lots, indicating A, B, and C. He then informed the locally responsible person about the group assignment and the study started the next day"
Blinding of participants and personnel (performance bias) Subjective outcome measures	Low risk	Participants and personnel were blinded
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Participants and personnel were blinded
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	Quote: "To ensure blinded evaluation of the FMS, videos of the assessment, where the patients sat on a chair and a mirror was placed 45° behind them, were sent to an experienced therapist off site" and "Two experienced physiotherapists, blinded with respect to group assignment, assessed the secondary parameters together" and "The blinding was maintained at all measurement points"
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Quote: "To ensure blinded evaluation of the FMS, videos of the assessment, where the patients sat on a chair and a mirror was placed 45° behind them, were sent to an experienced therapist off site" and "Two experienced physiotherapists, blinded with respect to group assignment, assessed the secondary parameters together" and "The blinding was maintained at all measurement points"
Incomplete outcome data (attrition bias) Subjective outcome measures	Low risk	1 dropout occurred during the study period as the result of pneumonia, and 10 after the end of the intervention period until follow-up (6 were caused by being unavailable, 2 resulted from refusal to further participate and 2 were caused by cardiac conditions). ITT analysis was performed

Hesse 2011 (*Continued*)

Incomplete outcome data (attrition bias) Objective outcome measures	Low risk	1 dropout occurred during the study period as the result of pneumonia, and 10 after the end of the intervention period until follow-up (6 were caused by being unavailable, 2 resulted from refusal to further participate and 2 were caused by cardiac conditions). ITT analysis was performed
Selective reporting (reporting bias)	Low risk	All outcomes reported in the methods section and in the published trial protocol reported

Jo 2008

Methods	Method: Randomised cross-over trial Number of dropouts: none Number of adverse effects: 6 Deaths: none ITT: yes
Participants	Country: Republic of Korea Sample size: 10 participants Inclusion criteria: Unilateral right hemispheric stroke, younger than 70 years; noticeable cognitive disorder after stroke; written informed consent Exclusion criteria: Seizures; metal implants in the head, cardiac pacemaker; history of neuropsychiatric diseases
Interventions	Each participant underwent one of the following treatments: 1. single session of A-tDCS over the DLPFC of the non-lesioned hemisphere (2 mA for 30 minutes) followed by a single session sham tDCS over the DLPFC of the non-lesioned hemisphere (2 mA for 10 seconds), separated by at least 48 hours wash-out period 2. single session sham tDCS over the DLPFC of the non-lesioned hemisphere (2 mA for 10 seconds) followed by single A-tDCS over the DLPFC of the non-lesioned hemisphere (2 mA for 30 minutes), separated by at least 48 hours wash-out period
Outcomes	Outcomes were measured at baseline and at the end of intervention period 1. Response accuracy 2. Recognition accuracy 3. Response time of a two-back verbal working memory task
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**

Jo 2008 (*Continued*)

Random sequence generation (selection bias)	Unclear risk	Quote: "The order of stimulation was randomly assigned for all participants"
Allocation concealment (selection bias)	Unclear risk	Not described by the authors
Blinding of participants and personnel (performance bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Participants have been blinded by sham tDCS; blinding of personnel not stated
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Not described by the authors, however all outcome data were acquired by a computerised assessment during cognitive tasks
Incomplete outcome data (attrition bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Incomplete outcome data (attrition bias) Objective outcome measures	Low risk	All randomised participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	Unclear risk	All outcomes reported in the methods section reported

Kang 2008a

Methods	Method: randomised cross-over trial Dropouts: none Adverse effects: none (Paik 2015 [pers comm]) Deaths: none ITT: yes, all participants completed the study
Participants	Country: Republic of Korea Sample size: 10 people with stroke aged 48 to 84 years Inclusion criteria: not explicitly stated; written informed consent Exclusion criteria: cerebellar or brainstem lesion; metallic body implant; pacemaker; cochlear implant; history of seizure; unstable medical condition; inability to perform outcome tasks; Na+ or Ca++ channel blockers

Kang 2008a (*Continued*)

Interventions	Each participant underwent one of the following treatments 1. A-tDCS over the left DLPFC (2 mA for 20 minutes) followed by sham tDCS over the left DLPFC (2 mA for 1 minute), separated by at least 48 hours wash-out period 2. Sham tDCS over the left DLPFC (2 mA for 1 minute) followed by A-tDCS over the left DLPFC (2 mA for 20 minutes), separated by at least 48 hours wash-out period
Outcomes	Outcomes were measured at baseline, at the end of intervention period and at 3 hours postintervention 1. Attention (Go/No-Go test)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Quote: "We applied random order using computerized program. Randominzation program is freely available in the Internet. " (Paik 2015 [pers comm]) Comment: However, Patient-ID and first session stimulation type were continuously alternated, as can be seen in Table 1
Allocation concealment (selection bias)	Unclear risk	Not described by the authors
Blinding of participants and personnel (performance bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Participants were blinded; blinding of personnel not stated
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Outcome assessor was blinded; quote: "Both patients and the investigator that carried out the behavioral measurements were unaware of the type of intervention, because tDCS and sham were administered by another investigator who did not participate in the behavioral task or data analysis"
Incomplete outcome data (attrition bias) Subjective outcome measures	Low risk	There were no subjective outcome measures

Kang 2008a (*Continued*)

Incomplete outcome data (attrition bias) Objective outcome measures	Low risk	All randomised participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	Unclear risk	All outcomes reported in the methods section reported. There was no published a priori trial protocol (Paik 2015 [pers comm])

Khedr 2013

Methods	Study design: RCT (parallel assignment) Dropouts: none Adverse effects: none Deaths: none ITT: yes, all participants completed the study
Participants	Country: Egypt Number of participants: 40 outpatients Age: (mean ± SD) years Gender: 14 females (35%) Type of stroke: acute single thromboembolic non-haemorrhagic infarction, documented by MRI Time poststroke: (mean ± SD) 17.1 ± 3.6 days Severity: (range) 7 to 13 on NIHSS Exclusion criteria: extensive infarction (all territories of MCA), severe flaccid hemiplegia, head injury, neurological disease other than stroke, renal or hepatic impairment, previous administration of tranquilliser, inability to give informed consent, no MEP recorded from FDI muscle of the affected hand
Interventions	3 arms: 1. A-tDCS, 25 minutes at 2 mA daily for 6 consecutive days on M1 of the lesioned hemisphere, delivered by saline-soaked pads (5 × 7 cm) 2. C-tDCS, 25 minutes at 2 mA daily for 6 consecutive days on M1 of the non-lesioned hemisphere, delivered by saline-soaked pads (5 × 7 cm) 3. Sham tDCS, 25 minutes daily (with a short ramp-up and ramp-down of the current at the beginning and at the end of each session) for 6 consecutive days on M1 of the lesioned hemisphere
Outcomes	1. NIHSS at baseline, at the end of the intervention period and at 1, 2 and 3-month follow-up (0 to 42, with higher scores indicating a more severe stroke) 2. OMCASS at baseline, at the end of the intervention period and at 1, 2 and 3-month follow-up (0 to 100, with higher scores indicating no clinical impairment due to stroke) 3. BI at baseline, at the end of the intervention period and at 1, 2 and 3-month follow-up (0 to 100, with higher scores indicating better global function)

	4. Muscle strength according to MRC at the end of the intervention period, at 1, 2 and 3-month follow-up (0 to 5, with higher scores indicating higher muscle strength) 5. Cortical excitability (as measured by RMT and AMT) at the end of the intervention period, at 1, 2 and 3-month follow-up (with greater intensity indicating a higher threshold)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Each patient was given a serial number from a computer-generated randomisation table"
Allocation concealment (selection bias)	Low risk	Quote: "Group allocations (Anodal, Cathodal, or Sham) were placed in serially numbered, opaque closed envelopes ... and each patient was placed in the appropriate group after opening the corresponding sealed envelope"
Blinding of participants and personnel (performance bias) Subjective outcome measures	Low risk	Participants and therapists were blinded
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Participants and therapists were blinded
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	Outcome assessor was blinded
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Outcome assessor was blinded
Incomplete outcome data (attrition bias) Subjective outcome measures	Low risk	All randomised participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Incomplete outcome data (attrition bias) Objective outcome measures	Low risk	All randomised participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events

		were stated
Selective reporting (reporting bias)	Low risk	All outcomes stated in the study protocol and listed in the methods section of the publication have been reported

Kim 2009

Methods	Study design: single-blinded, sham-controlled, randomised cross-over study Dropouts: none Adverse effects: none Deaths: none ITT: yes
Participants	Country: Republic of Korea Number of participants: 10 subacute participants Age: (mean) 62.8 years Gender: seven female (70%) Type of stroke: first-ever stroke, as confirmed by MRI; 2 had haemorrhagic stroke (20%) Time poststroke: (mean) 6.4 weeks, range 3 to 12 weeks Severity: participants could grasp and release independently; degree of strength according to MRC was ≥ 3 but < 5 for all paretic finger flexors and extensors. Participants did not have a family history of seizure, could understand the purpose of the study and did not have any deformities or contractures of the fingers, hands, elbows and shoulders Inclusion criteria: not explicitly stated Exclusion criteria: not explicitly stated
Interventions	Each participant underwent 2 different stimulation conditions, each for 20 minutes, separated by at least 24 hours of rest 1. A-tDCS (1 mA) over the primary motor cortex of the first dorsal interossei muscle of the lesioned hemisphere 2. Sham tDCS over the primary motor cortex of the first dorsal interossei muscle of the lesioned hemisphere
Outcomes	1. Box and Block test (the transfer of as many wooden blocks as possible with the lesioned hand from 1 compartment to the other within 1 minute, with a high value indicating good function) and finger acceleration measurement (in g, with a higher value indicating higher acceleration) at baseline, at 5 minutes of stimulation, immediately and at 30 and 60 minutes after stimulation 2. Visual analogue scales to assess attention and fatigue (score 1 to 7; 1 = no attention/fatigue; 7 = highest level of attention/fatigue) at baseline, immediately and at 30 and 60 minutes after stimulation
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**

Kim 2009 (*Continued*)

Random sequence generation (selection bias)	Unclear risk	Quote: "A doctor who works in tDCS's room, he randomised patients on his own sequence" (Kim 2013 [pers comm])
Allocation concealment (selection bias)	Unclear risk	Quote: "A doctor who works in tDCS's room, he randomised patients on his own sequence" (Kim 2013 [pers comm])
Blinding of participants and personnel (performance bias) Subjective outcome measures	Low risk	Both participants and personnel were blinded (Kim 2013 [pers comm])
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Both participants and personnel were blinded (Kim 2013 [pers comm])
Blinding of outcome assessment (detection bias) Subjective outcome measures	High risk	No blinding of outcome assessors. Quote: "An examiner who was aware of the stimulation method used was instructed not to communicate with patients during the task and evaluated patients' performances"
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	No blinding of outcome assessment, but the review authors judge that the outcome measurement is not likely to be influenced by lack of blinding. Quote . Quote: "An examiner who was aware of the stimulation method used was instructed not to communicate with patients during the task and evaluated patients' performances"
Incomplete outcome data (attrition bias) Subjective outcome measures	Low risk	All randomised participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Incomplete outcome data (attrition bias) Objective outcome measures	Low risk	All randomised participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	Unclear risk	All outcomes reported in the methods section reported

Kim 2010

Methods	Study design: double-blind sham-controlled multicentre randomised trial Dropouts: 1 participant discontinued treatment because of dizziness and another because of headache (2 out of 20) during follow-up Adverse effects: none Deaths: none ITT: no
Participants	Country: Republic of Korea Number of participants: 20 participants from neurorehabilitation units at 2 tertiary university hospitals Age: (mean ± SD) 57.27 ± 4.95 Gender: 7 female (35%) Type of stroke: first-ever cortical or subcortical ischaemic stroke Time poststroke: (mean ± SD) A-tDCS group: 34 ± 27.1 days; C-tDCS: 19.4 ± 9.3 days; sham tDCS: 22.9 ± 7.5 days Severity: mild to moderate motor deficits (MRC score $\geq$ 2) Inclusion criteria: first-ever ischaemic strokes in the cortical or subcortical area within the previous 2 months and mild to moderate motor deficits (MRC score $\geq$ 2) Exclusion criteria: cerebellar or brainstem lesions; presence of a metallic foreign body implant, such as a pacemaker or an artificial cochlea; history of seizure or another unstable medical condition; severe language disturbance; neglect, depression or cognitive deficits (based on the MMSE, 10 of 30 points) that would limit participation; history of severe alcohol or drug abuse; previous stroke that resulted in residual disability; premorbid arm impairment; and hemiplegic shoulder pain; use Na^+ or Ca^{2+} channel blockers or NMDA receptor antagonists
Interventions	Number of arms: 3 Each participant received 10 sessions (5 times per week for 2 weeks during conventional occupational therapy aiming at improving the co-ordination and strength of the paretic hand) of 1 of the following interventions: 1. A-tDCS over the primary motor cortex (M1) of the contralateral FDI muscle of the lesioned hemisphere (2 mA for 20 minutes) 2. C-tDCS over the M1 of the ipsilateral FDI of the non-lesioned hemisphere (2 mA for 20 minutes) 3. Sham tDCS over the M1 of the contralateral FDI (for 20 minutes)
Outcomes	Outcomes used: FMA 0 to 66 (with higher scores indicating better function) for assessing upper limb motor function and MBI 0 to 100 (with higher scores indicating better global function) Time point of measurement: at baseline, 1 day and 6 months after intervention
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Patients were randomly assigned to one of the three groups (atDCS, ct-DCS or Sham treatment) using a stratified

Kim 2010 (*Continued*)

		randomisation procedure with permuted block size of 3 and an algorithm that balanced Brunnstrom stages"
Allocation concealment (selection bias)	Low risk	Quote: "Sealed opaque envelopes were used for randomisation"
Blinding of participants and personnel (performance bias) Subjective outcome measures	Low risk	Participants and personnel were blinded
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Participants and personnel were blinded
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	Quote: "Two independent raters blinded to the type of intervention performed outcome measurements"
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Quote: "Two independent raters blinded to the type of intervention performed outcome measurements"
Incomplete outcome data (attrition bias) Subjective outcome measures	Unclear risk	1 participant of each interventional arm (14% each) discontinued intervention; we excluded these participants from analysis
Incomplete outcome data (attrition bias) Objective outcome measures	Unclear risk	1 participant of each interventional arm (14% each) discontinued intervention; we excluded these participants from analysis
Selective reporting (reporting bias)	Unclear risk	All outcomes reported in the methods section reported

Ko 2008

Methods	Method: randomised cross-over trial Number of dropouts: not described Number of adverse effects: none Deaths: none ITT: yes, all participants completed the study
Participants	Country: Republic of Korea Sample size: 15 people with stroke and neglect Baseline characteristics: 10 men and 5 women; mean age (SD): 62 (9) years; time since stroke (range) 29-99 days; right-hemispheric stroke; right-handed Inclusion criteria: not explicitly described; written informed consent Exclusion criteria: metal in the head or skin lesions in the electrode area; uncontrolled

	medical problems; severe cognitive impairments
Interventions	Each participant underwent one of the following conditions 1. A-tDCS over the right posterior parietal cortex (PPC) (2 mA for 20 minutes) followed by sham tDCS (2 mA for 10 seconds), divided by 48 hours of wash-out period 2. Sham tDCS (2 mA for 10 seconds) followed by A-tDCS over the right posterior parietal cortex (PPC) (2 mA for 20 minutes), divided by 48 hours of wash-out period
Outcomes	Outcomes were measured at baseline and at the end of intervention period 1. Line bisection test 2. Letter-structured cancellation test 3. Shape-unstructured cancellation test
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Quote: "All of patients participated in both anodal and sham DC brain polarization with counterbalanced and randomized order and 48 hour interval between two sessions"
Allocation concealment (selection bias)	Unclear risk	Not described by the authors
Blinding of participants and personnel (performance bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Blinding of participants and personnel (performance bias) Objective outcome measures	Unclear risk	Participants were blinded, whereas blinding of personnel was not stated; however the review authors judge that the outcome measurement is not likely to be influenced by lack of blinding
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Blinding of outcome assessment (detection bias) Objective outcome measures	Unclear risk	Not described by the authors
Incomplete outcome data (attrition bias) Subjective outcome measures	Low risk	There were no subjective outcome measures

Ko 2008 (*Continued*)

Incomplete outcome data (attrition bias) Objective outcome measures	Low risk	All participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	Unclear risk	All outcomes reported in the methods section reported

Lee 2014

Methods	Method: RCT Number of dropouts: 5 (3 out of 42 in the experimental groups (7%) and 2 out of 22 in the control group (9%)) Number of adverse effects: no major adverse events Deaths: none ITT: no
Participants	Country: Republic of Korea Sample size: 59 people with stroke (39 in the experimental groups and 20 in the control group) Inclusion criteria: unilateral hemiparesis caused by stroke; first stroke within 1 month prior to enrolment; shoulder motor strength Medical Research Council grade ≤ 2 Exclusion criteria: contraindications to brain stimulation; previous history of brain neurosurgery or epilepsy; metallic implants in the brain; severe cognitive impairment; aphasia interfering with understanding study instructions; poor sitting balance; impaired vision; hemispatial neglect
Interventions	3 arms 1. C-tDCS over the hand area of M1 over the non-lesioned hemisphere (2 mA for 20 minutes) during occupational therapy aiming at functional improvement of the affected arm for 30 minutes per day, 5 times a week for 3 weeks; 2. Virtual reality training aiming at functional improvement of the affected arm for 30 minutes per day, 5 times a week for 3 weeks; 3. C-tDCS plus virtual reality training aiming at functional improvement of the affected arm for 30 minutes per day, 5 times a week for 3 weeks
Outcomes	Outcomes were measured at baseline and at the end of intervention period 1. Modified Ashworth Scale 2. Manual Muscle Testing 3. Manual Function Test 4. Fugl-Meyer assessment, upper extremity subscale 5. Korean-Modified Barthel Index
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement

Random sequence generation (selection bias)	Low risk	Quote: "All of the enrolled patients were randomly assigned to 1 of 3 groups using a table of random numbers"
Allocation concealment (selection bias)	Unclear risk	Not described by the authors
Blinding of participants and personnel (performance bias) Subjective outcome measures	Low risk	Participants and personnel providing the base treatment were blinded
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Participants and personnel providing the base treatment were blinded
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	Quote: "All evaluations were performed before and immediately after treatment by a single experienced occupational therapist who was not aware of the treatment allocation"
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Quote: "All evaluations were performed before and immediately after treatment by a single experienced occupational therapist who was not aware of the treatment allocation"
Incomplete outcome data (attrition bias) Subjective outcome measures	High risk	3 participants out of 42 (7%) in the experimental groups and 2 out of 22 (9%) were lost to follow-up and excluded from the analysis. 2 out of the 3 losses to follow-up in the experimental group dropped out due to "medical problem(s)"
Incomplete outcome data (attrition bias) Objective outcome measures	High risk	3 participants out of 42 (7%) in the experimental groups and 2 out of 22 (9%) were lost to follow-up and excluded from the analysis. 2 out of the 3 losses to follow-up in the experimental group dropped out due to "medical problem(s)"
Selective reporting (reporting bias)	Unclear risk	All outcomes listed in the methods section reported

Lindenberg 2010

Methods	Study design: sham-controlled double-blinded randomised trial Dropouts: not stated Adverse effects: none Deaths: not stated, likely none ITT: not stated
Participants	Country: USA Number of participants: 20 chronic stroke participants Age: (mean ± SD) 55.8 ± 12.9 years Gender: 5 female (25%) Type of stroke: first and only ischaemic stroke Time poststroke: (mean ± SD) 40.3 ± 23.4 months Severity: UE-FM Score (mean ± SD) 39.8 ± 11.5 Inclusion criteria: ischaemic stroke in the territory of the medial cerebral artery at least 5 months before enrolment; no previous or subsequent strokes; MRC strength grade of 3/5 in extensor muscles of the lesioned upper extremity in the acute phase with at least 15 degrees of active wrist dorsiflexion at enrolment Exclusion criteria: additional neurological or psychiatric disorders; concurrent use of CNS-affecting drugs
Interventions	Number of arms: 2, each participant underwent 5 consecutive sessions of physical therapy/occupational therapy and 1 of the following interventions 1. Dual-tDCS: A-tDCS over M1 of the lesioned hemisphere + C-tDCS over M1 of the non-lesioned hemisphere (1.5 mA each, for 30 minutes) 2. Sham tDCS (for 30 minutes)
Outcomes	Primary outcome measure: UE-FM scores (0 to 66, with higher scores reflecting better motor performance) Secondary outcome measure: WMFT (with lower scores indicating better motor performance) Time point of measurement: at baseline and at 3 and 7 days after the last intervention session
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Patients were randomly assigned to one of two groups ... using a block randomisation with 3 strata of impairment"
Allocation concealment (selection bias)	Unclear risk	Not described
Blinding of participants and personnel (performance bias) Subjective outcome measures	Low risk	There were no subjective outcome measures

Lindenberg 2010 (*Continued*)

Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Participants and personnel were blinded
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Quote: "Each patient underwent motor impairment assessments and MRI at baseline and after the intervention, conducted by trained individuals who were blinded to the type of intervention the patients received"
Incomplete outcome data (attrition bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Incomplete outcome data (attrition bias) Objective outcome measures	Unclear risk	All randomised participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	Unclear risk	All outcomes stated in the methods section were reported

Mahmoudi 2011

Methods	Study design: sham-controlled cross-over randomised trial Dropouts: not stated, most likely none Adverse effects: none Deaths: not stated, most likely none ITT: not stated
Participants	Country: Iran Number of participants: 10 right-handed stroke participants with no sensory deficits Age: (mean ± SD) 60.8 ± 14.1 years Gender: 3 female (30%) Type of stroke: ischaemic Time poststroke: (mean ± SD) 8.3 ± 5.45, range 1 to 16 months Severity: median Brunnstrom stage 6 Inclusion criteria: single ischaemic stroke with more than 1 month's duration of mild to moderate motor deficit (to ensure that all participants could perform all items on the JTT Exclusion criteria: clinically significant or unstable medical or psychiatric disorder with history of substance abuse, any neuropsychiatric comorbidity other than stroke and contraindications to tDCS

Interventions	Each participant underwent 5 different treatments with at least 4 days of each of the following 1. A-tDCS of lesioned M1 (with the cathodal electrode positioned at the contralateral supraorbital area, 1 mA for 20 minutes) 2. A-tDCS of lesioned M1 (with the cathodal electrode positioned at the contralateral deltoid muscle, 1 mA for 20 minutes) 3. C-tDCS of lesioned M1 (with the anodal electrode positioned at the contralateral supraorbital area, 1 mA for 20 minutes) 4. Dual-tDCS: A-tDCS of lesioned M1 + C-tDCS of non-lesioned M1 5. Sham tDCS (20 minutes)
Outcomes	Outcomes used: JTT (with familiarisation sessions) Time points of measurement: at baseline and after stimulation
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Quote: "The order of these conditions was counterbalanced and randomised across patients"
Allocation concealment (selection bias)	Unclear risk	Not described
Blinding of participants and personnel (performance bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Participants probably were blinded; blinding of personnel was not described Quote: "Patients were then randomised to the double-blinded, sham-controlled cross over part of the experiment"
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Quote: "A blinded physiatrist-instructed not to communicate with the patients during the task-evaluated patients' performance"
Incomplete outcome data (attrition bias) Subjective outcome measures	Low risk	There were no subjective outcome measures

Incomplete outcome data (attrition bias) Objective outcome measures	Unclear risk	All participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	Unclear risk	All outcomes stated in the methods section were reported

Nair 2011

Methods	Study design: randomised double-blind sham-controlled trial Dropouts: none Adverse effects: none Deaths: none ITT: yes
Participants	Country: USA Number of participants: 14 right-handed Age: (mean) 55.8, range of 40 to 76 years Gender: 5 female (36%) Type of stroke: first-ever unihemispheric stroke, 6 (43%) had right-hemispheric stroke, 9 (64%) had predominantly cortical stroke, 5 (36%) had predominantly subcortical stroke Time poststroke: (mean ± SD) Severity: moderate to severe upper extremity impairment, UE-FM (mean ± SD) 30.1 ± 10.4 Inclusion criteria: not clearly stated Exclusion criteria: previous history of stroke, bilateral infarcts, haemorrhage, arthritis, chronic pain, other neurological diseases
Interventions	Number of arms: 2 participants underwent occupational therapy + 1 of the following conditions 1. C-tDCS over M1 of the non-lesioned hemisphere (1 mA for 30 minutes) 2. Sham tDCS over M1 of the non-lesioned hemisphere (for 30 minutes)
Outcomes	Primary outcomes: mean ROM for shoulder abduction, elbow extension and wrist extension (3J-ROM; calculated as active ROM100/passive ROM for each joint, 0 to 100, with higher values indicating better function) and proportional change in UE-FM (0 to 66, with higher scores indicating better motor performance) Time point of measurement: at baseline, after the intervention and at 1-week follow-up
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Not described

Nair 2011 (*Continued*)

Allocation concealment (selection bias)	Unclear risk	Not described, quote: "Patients were randomised to either the cathodal group or the sham group"
Blinding of participants and personnel (performance bias) Subjective outcome measures	Low risk	There were no subjective outcome measures.
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Participants and personnel were blinded
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Quote: "The 3J-ROM and the FM assessments were done by an investigator who was blind with regard to whether real tDCS or sham tDCS was applied"
Incomplete outcome data (attrition bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Incomplete outcome data (attrition bias) Objective outcome measures	Low risk	All randomised participants completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	High risk	Results of Wolf Motor Function Test, Modified Ashworth Scale and Motor Activity Log Rating Scale were not reported, as intended by the protocol (http://ClinicalTrials.gov/show/NCT00792428)

Park 2013

Methods	Method: RCT Number of dropouts: unclear Number of adverse effects: none Deaths: none ITT: unclear
Participants	Country: Republic of Korea Sample size: 11 participants Inclusion criteria: not explicitly stated; newly diagnosed with radiologically confirmed stroke; written informed consent Exclusion criteria: patients with metal in the head or with skin lesions in the electrode

	area; significant aphasia
Interventions	2 arms 1. A-tDCS to the bilateral prefrontal cortex (2 mA for 30 minutes) with the cathode positioned at the non-dominant arm + computer-assisted cognitive rehabilitation five times a week for 18.5 days 2. Sham tDCS with the anode positioned over the bilateral prefrontal cortex (2 mA for 30 seconds) with the cathode positioned at the non-dominant arm + computer-assisted cognitive rehabilitation five times a week for 17.8 days
Outcomes	Outcomes were measured at baseline and at study end 1. Korean Version of the MMSE 2. Seoul Computerized Neuropsychological Test (SCNT)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Quote: "The patients were randomly assigned to two groups"
Allocation concealment (selection bias)	Unclear risk	Not described by the authors
Blinding of participants and personnel (performance bias) Subjective outcome measures	Unclear risk	Patients were blinded; whereas blinding of personnel was not clearly described by the authors: "The tDCS and the cognitive function test were performed by two independent personnel"
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Patients were blinded; whereas blinding of personnel was not clearly described by the authors: "The tDCS and the cognitive function test were performed by two independent personnel"
Blinding of outcome assessment (detection bias) Subjective outcome measures	Unclear risk	Quote: "The tDCS and the cognitive function test were performed by two independent personnel"
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Quote: "The tDCS and the cognitive function test were performed by two independent personnel."
Incomplete outcome data (attrition bias) Subjective outcome measures	Unclear risk	All randomised participants apparently completed the study; no treatment withdrawals, no losses to follow-up, no trial

		group changes and no major adverse events were stated
Incomplete outcome data (attrition bias) Objective outcome measures	Unclear risk	All randomised participants apparently completed the study; no treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	Unclear risk	Not all of the 10 dimensions of the Seoul Computerized Neuropsychological Test (SCNT), as stated in the methods section, have been reported

Qu 2009

Methods	Study design: RCT Dropouts: none Adverse effects: not reported Deaths: none ITT: yes Duration: 1 month
Participants	Country: China Number of participants: 50 Age: tDCS (mean ± SD): 45 (11), control: 45 (14) years Gender: tDCS: 21 (84%) male, control: 22 (88%) male Type of stroke: 15 (60%) ischaemic Time poststroke: tDCS: 6 months (3 to 36), control: 4 months (3 to 12) Severity: tDCS: FMA 12 (5 to 44), BI 64 (17), control: FMA 5 (2 to 35), BI: 72 ± 22 Inclusion criteria: admitted to hospital between June 2008 and June 2009 and MRI-confirmed stroke Exclusion criteria: not stated
Interventions	2 arms 1. C-tDCS over lesioned M1 (0.5 mA for 20 minutes) once a day for 5 consecutive days, for 1 month + physical therapy (40 minutes/session, twice a day, for 5 times a week) 2. Physical therapy (40 minutes/session, twice a day, for 5 times a week)
Outcomes	Outcomes used: MAS, FMA, BI Time points of measurement: at baseline and at the end of the intervention period
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**

Qu 2009 (*Continued*)

Random sequence generation (selection bias)	Unclear risk	Quote: "Subjects were randomly assigned using a computer-generated randomisation list by a single investigator" (Wu 2013b [pers comm])
Allocation concealment (selection bias)	Unclear risk	Quote: "The assigned random number was inputted into the stimulator device by the same investigator. She did not participate in other parts of the study" (Wu 2013b [pers comm])
Blinding of participants and personnel (performance bias) Subjective outcome measures	Unclear risk	Quote: "All other investigators, subjects, and outcome assessors remained blinded to group allocation until the completion of the final statistical analyses" (Wu 2013b [pers comm])
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Quote: "All other investigators, subjects, and outcome assessors remained blinded to group allocation until the completion of the final statistical analyses" (Wu 2013b [pers comm])
Blinding of outcome assessment (detection bias) Subjective outcome measures	Unclear risk	See "Blinding of participants and personnel"
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	See "Blinding of participants and personnel"
Incomplete outcome data (attrition bias) Subjective outcome measures	Low risk	All participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Incomplete outcome data (attrition bias) Objective outcome measures	Low risk	All participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	Unclear risk	All outcomes from the methods section were reported

Rossi 2013

Methods	Study design: single-centre, randomised, double-blind, sham-controlled trial Dropouts: none Adverse effects: none Deaths: none ITT: yes, all participants completed the study
Participants	Country: Italy Number of participants: 50 Inclusion criteria: age between 18 and 80 years and an acute ischaemic lesion in the territory of the MCA, a score between 6 and 20 at the NIHSS and a UE-FM score between 15 and 55 Exclusion criteria: pre stroke mRS > 1, thrombolysis, history of seizure, advanced systemic diseases coexistent neurological/psychiatric diseases, current treatment with antidepressants, antipsychotics or benzodiazepines Age: (mean ± SD) tDCS-group: 66.1 (± 14.3); sham group: 70.3 (± 13.5) years Gender: tDCS group: 12 male (48%), sham group: 14 male (56%) Time poststroke: 2 days Severity according NIHSS at baseline: tDCS-group: 15.4 (± 4.9); sham group: 14.1 (± 3.5)
Interventions	Number of arms: 2; each participant underwent 1 of the following conditions 1. 5 daily sessions of A-tDCS to M1 of the lesioned hemisphere (2 mA for 20 minutes) 2. 5 daily sessions of sham tDCS (for 20 minutes)
Outcomes	Primary outcomes: UE-FM at baseline, at the end of intervention and at 3 month follow-up Secondary outcomes: NIHSS at baseline, at the end of intervention and at 3 month follow-up; mRS at baseline, at the end of intervention and at 3-month follow-up
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomisation scheme was generated by a computer program (Koch 2013 [pers comm])
Allocation concealment (selection bias)	Unclear risk	Allocation was performed by a third person via telephone (Koch 2013 [pers comm])
Blinding of participants and personnel (performance bias) Subjective outcome measures	Low risk	Personnel were blinded to the type of treatment (Koch 2013 [pers comm])

Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Personnel were blinded to the type of treatment (Koch 2013 [pers comm])
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	Evaluators were blinded (Koch 2013 [pers comm])
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Evaluators were blinded (Koch 2013 [pers comm])
Incomplete outcome data (attrition bias) Subjective outcome measures	Low risk	All participants completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Incomplete outcome data (attrition bias) Objective outcome measures	Low risk	All participants completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	Low risk	All outcomes were stated as mentioned in preceding conference papers

Sohn 2013

Methods	Study design: randomised sham-controlled cross-over trial Number of dropouts: not stated Number of adverse effects: not stated Deaths: not stated ITT: unclear
Participants	Country: Republic of Korea Sample size: 11 (age in years (mean (SD)): 58 (15); time since stroke in days (mean (SD)): 63 (17)) Inclusion criteria: not explicitly stated, undergoing rehabilitation following acute treatment Exclusion criteria: history of previous stroke; history of previous epilepsy/seizure; family history of epilepsy/seizure; metal in the cranial cavity; permanent pacemaker; previous or persistent other neurological disorders; stroke lesion in the cerebellum; contracture of the lower limb on the affected side
Interventions	Each participant underwent one of the following two conditions 1. A-tDCS over M1 of the affected hemisphere (2 mA for 10 minutes) followed by 48 hours of resting period followed by sham tDCS over M1 of the affected hemisphere (2 mA for 20 seconds) 2. Sham tDCS over M1 of the affected hemisphere (2 mA for 20 seconds) followed

	by 48 hours of resting period followed by A-tDCS over M1 of the affected hemisphere (2 mA for 10 minutes)
Outcomes	Outcomes were measured at baseline and at study end 1. Balance performance (Balance System SD) 2. Isometric strength of knee extensor muscles (Biodex System 4 Pro)
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Quote: "The two stimulation experiments were performed in random order for each patient"
Allocation concealment (selection bias)	Unclear risk	Not described by the authors
Blinding of participants and personnel (performance bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Blinding of participants and personnel (performance bias) Objective outcome measures	Unclear risk	Participants were blinded, quote: "Patients were unlikely to be aware of any difference between real and sham stimulation", whereas personnel were probably not; quote: "Second, a double-blind design was not used for experiments"
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Outcome assessor probably was not blinded, however the review authors judge that the outcome measurement is not likely to be influenced by lack of blinding; quote: "Second, a double-blind design was not used for experiments"
Incomplete outcome data (attrition bias) Subjective outcome measures	Unclear risk	All participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Incomplete outcome data (attrition bias) Objective outcome measures	Unclear risk	All participants apparently completed the study. No treatment withdrawals, no losses

		to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	Unclear risk	All outcomes listed in the methods section reported

Sunwoo 2013

Methods	Study design: randomised controlled cross-over trial Number of dropouts: not stated Number of adverse effects: 3 (mild headache after real dual-tDCS) Deaths: not stated ITT: unclear
Participants	Country: Republic of Korea Sample size: 10 chronic stroke patients (mean age 63 years) with left unilateral visuospatial neglect after stroke Inclusion criteria: not explicitly stated except written informed consent Exclusion criteria: metallic implants in the head; skull defect; history of seizure; uncontrolled medical problems; severe cognitive impairment
Interventions	Each participant underwent all of the following conditions (separated by a resting period of at least 24 hours) 1. A-tDCS over the right PPC (1 mA for 20 minutes) plus C-tDCS over the left PPC (1 mA for 20 minutes) 2. A-tDCS over the right PPC (1 mA for 20 minutes) plus sham tDCS over the left PPC (1 mA for 10 seconds) 3. Sham tDCS over the right PPC (1 mA for 10 seconds) plus sham tDCS over the left PPC (1 mA for 10 seconds)
Outcomes	Outcomes were measured at baseline and at the end of stimulation 1. Line bisection test 2. Star cancellation test
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Quote: "All patients participated in dual, single, and sham tDCSsessions at intervals of at least 24 hours between sessions in a randomized order"
Allocation concealment (selection bias)	Unclear risk	Not described by the authors

Sunwoo 2013 (*Continued*)

Blinding of participants and personnel (performance bias) Subjective outcome measures	Low risk	Participants were blinded, whereas blinding of personnel was not stated. However, the review authors judge that the outcome measurement is not likely to be influenced by lack of blinding
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Participants were blinded, whereas blinding of personnel was not stated. However, the review authors judge that the outcome measurement is not likely to be influenced by lack of blinding
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	Outcome assessor was blinded; quote: "Both tests were performed by a single examiner who was blinded to the type of stimulation"
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Outcome assessor was blinded; quote: "Both tests were performed by a single examiner who was blinded to the type of stimulation"
Incomplete outcome data (attrition bias) Subjective outcome measures	Unclear risk	All participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Incomplete outcome data (attrition bias) Objective outcome measures	Unclear risk	All participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	Unclear risk	All outcome measures listed in the methods section have been reported

Tahtis 2012

Methods	Study design: RCT Number of dropouts: not stated Number of adverse effects: none Deaths: not stated ITT: unclear
Participants	Country: not stated 14 subacute stroke patients (2 to 8 weeks after stroke) Inclusion criteria: mobile stroke survivors with focal, ischaemic stroke; walking difficulties after stroke (self reported) Exclusion criteria: previous neurological conditions, seizure; musculoskeletal insult; pace-

	maker
Interventions	2 arms 1. Dual-tDCS with the anode placed over M1 of the lesioned hemisphere and the cathode placed over M1 of the non-lesioned hemisphere (2 mA for 15 minutes) 2. Sham tDCS with the anode placed over M1 of the lesioned hemisphere and the cathode placed over M1 of the non-lesioned hemisphere (2 mA for < 30 seconds)
Outcomes	Outcomes were measured at baseline and at study end 1. Performance Oriented Mobility Assessment 2. TUG 3. Tinnetti Balance and Gait Index
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Quote: "Subjects were randomised to either the treatment group or to placebo"
Allocation concealment (selection bias)	Unclear risk	Not described by the authors
Blinding of participants and personnel (performance bias) Subjective outcome measures	Unclear risk	Participants were blinded, whereas blinding of personnel was not stated
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Participants were blinded, whereas blinding of personnel was not stated
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	Outcome assessors were blinded; quote: "Two independent assessors blindly assessed the POMA" and "Three consecutive recordings of the TUG were taken by the same blinded assessor"
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Outcome assessors were blinded; quote: "Two independent assessors blindly assessed the POMA" and "Three consecutive recordings of the TUG were taken by the same blinded assessor"
Incomplete outcome data (attrition bias) Subjective outcome measures	Unclear risk	All participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated

Tahtis 2012 (*Continued*)

Incomplete outcome data (attrition bias) Objective outcome measures	Unclear risk	All participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	Unclear risk	All outcomes reported in the methods section reported

Tedesco Triccas 2015b

Methods	Study design: RCT Number of dropouts: 1 in the A-tDCS group (skin reaction due to tDCS) Number of adverse effects: 1 in the A-tDCS group (skin reaction due to tDCS) Deaths: none ITT: no
Participants	Country: UK Sample size: 22 participants Inclusion criteria: aged 18 and above; clinical diagnosis of first-ever stroke, confirmed by a neurologist/stroke specialist; time since stroke > 2 weeks prior to enrolment; upper and fore-arm and hand paresis (MRC > 2); minimal spasticity (MAS $\leq$ 2); partial shoulder flexion with gravity; good sitting balance; informed consent Exclusion criteria: MMSE < 24; other neurological conditions; shoulder pain resulting from shoulder flexion > 90°; epilepsy; metal implants in the skull or brain; previous brain neurosurgery; medications that influence cortical excitability; previous adverse effects when stimulated with tDCS; pregnancy
Interventions	2 arms 1. A-tDCS over M1 of the affected hemisphere (1 mA for 20 minutes) during the first 20 minutes of a 60 minute robotic training session with the ArmeoSpring device for 18 sessions during 8 weeks (approximately 2 to 3 sessions per week) 2. Sham tDCS over M1 of the affected hemisphere (1 mA for 20 minutes) during the first 20 minutes of a 60 minute robotic training session with the ArmeoSpring device for 18 sessions during 8 weeks (approximately 2 to 3 sessions per week)
Outcomes	Outcomes were measured at baseline and at the end of intervention and at 3 months follow-up Primary outcomes: 1. UE-FM Secondary outcomes: 1. ARAT 2. MAL 3. SIS 3.0
Notes	
Risk of bias	

Tedesco Triccas 2015b (*Continued*)

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Block randomisation was used with a computer program called 'random allocation software"'
Allocation concealment (selection bias)	Low risk	Quote: "To conceal allocation, an independent person placed the printed papers of sham/real in sealed opaque envelopes according to block randomisation. As soon as a participant enrolled in the study, the researcher made a telephone call to the independent person who then stated whether 'real' or 'sham' was to be administered to the participant"
Blinding of participants and personnel (performance bias) Subjective outcome measures	Unclear risk	Participants apparently were blinded, but blinding of personnel not stated
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Participants apparently were blinded, but blinding of personnel not stated
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	Quote: "Three blinded assessors, trained qualified physiotherapists with experience in stroke assessment and neurological rehabilitation carried out clinical assessments. In addition to the clinical assessor, video recorded FMA and ARAT assessments were also scored by an additional blinded clinical assessor"
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Quote: "Three blinded assessors, trained qualified physiotherapists with experience in stroke assessment and neurological rehabilitation carried out clinical assessments. In addition to the clinical assessor, video recorded FMA and ARAT assessments were also scored by an additional blinded clinical assessor"
Incomplete outcome data (attrition bias) Subjective outcome measures	Unclear risk	1 participant in the A-tDCS group dropped out (1 out of 23; 4%) because of a skin reaction due to tDCS, whereas in the sham group there were no dropouts. Quote: "After four intervention sessions, a participant with chronic stroke dropped out of the trial due to a skin reaction after receiving four

Tedesco Triccas 2015b (*Continued*)

		real tDCS sessions"
Incomplete outcome data (attrition bias) Objective outcome measures	Unclear risk	1 participant in the A-tDCS group dropped out (1 out of 23; 4 %) because of a skin reaction due to tDCS, whereas in the sham group there were no dropouts. Quote: "After four intervention sessions, a participant with chronic stroke dropped out of the trial due to a skin reaction after receiving four real tDCS sessions"
Selective reporting (reporting bias)	Unclear risk	All outcome measures listed in the methods section have been reported. All outcome measures from the published study protocol have been reported, except measures of cortical excitability

Viana 2014

Methods	Study design: RCT Number of dropouts: none Number of adverse effects: none Deaths: none ITT: yes
Participants	Country: Brazil Sample size: 20 participants Inclusion criteria: unilateral stroke within 6 months prior to enrolment; age above 21 years; residual weakness/spasticity of the affected upper limb; being able to hold a Nintendo Wii controller with paretic hand; no cognitive deficits as measured by MMSE; being able to follow instructions and interact with the games; informed consent Exclusion criteria: history of seizure; cerebral aneurysm; prior surgery involving metallic implants
Interventions	2 arms 1. A- tDCS over M1 of the affected hemisphere (2 mA for 13 minutes) plus virtual reality training using Nintendo Wii for 60 minutes 3 days a week for 5 weeks 2. S- tDCS over M1 of the affected hemisphere (2 mA for 30 seconds) plus virtual reality training using Nintendo Wii for 60 minutes 3 days a week for 5 weeks
Outcomes	Outcomes were measured at baseline and at the end of intervention and at 5-week follow-up Primary outcomes 1. UE-FM 2. WMFT Secondary outcomes 1. MAS 2. Hand-held dynamometry

Notes		
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Participants were randomly assigned to the experimental or control groups by using sealed opaque envelopes"
Allocation concealment (selection bias)	Low risk	Quote: "Participants were randomly assigned to the experimental or control groups by using sealed opaque envelopes"
Blinding of participants and personnel (performance bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Quote: "The participants and the researchers involved in the VRT interventions and evaluations were blind to group allocations for the duration of the trial"
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Quote: "The participants and the researchers involved in the VRT interventions and evaluations were blind to group allocations for the duration of the trial"
Incomplete outcome data (attrition bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Incomplete outcome data (attrition bias) Objective outcome measures	Low risk	All participants completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	Unclear risk	All outcomes listed in the methods section reported

Wang 2014

Methods	Study design: RCT Number of dropouts: not stated Number of adverse effects: 3 (mild tingling) Deaths: none ITT: unclear
Participants	Country: USA Sample size: 9 participants Inclusion criteria: aged between 18 and 90 years; first time clinical ischaemic or haemorrhagic stroke, radiologically confirmed; > 20° wrist extension and > 10° finger extension (all fingers); time since stroke more than 1 month prior to study enrolment Exclusion criteria: significant prestroke disability; advanced or terminal disease; substantial decrease in alertness, language reception or attention interfering with understanding instructions; contraindications to TMS; history of alcohol/drug abuse; participation in another study targeting stroke recovery; use of neuropsychotropic drugs (monoamine oxidase-inhibitors); epilepsy; marked agitation/anxiety; having already received MP or tDCS treatment; pregnancy
Interventions	3 arms 1. Real tDCS plus placebo MP: A-tDCS with the anode placed over M1 of the affected hemisphere (1 mA for 20 minutes) and the cathode placed over contralateral M1 plus placebo MP 1 hour prior to stimulation once 2. Sham tDCS plus MP: sham tDCS with the anode placed over M1 of the affected hemisphere (1 mA for 10 seconds) and the cathode placed over contralateral M1 plus 20 mg of MP 1 hour prior to stimulation once 3. Real tDCS plus MP: A-tDCS with the anode placed over M1 of the affected hemisphere (1 mA for 20 minutes) and the cathode placed over contralateral M1 plus 0 mg of MP 1 hour prior to stimulation once
Outcomes	Outcomes were measured at baseline, immediately after the intervention and 30 minutes after the end of intervention 1. TMS (cortical excitability) 2. PPT (hand function)
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Subjects were randomly assigned to 1 of 3 groups"
Allocation concealment (selection bias)	Unclear risk	Not described by the authors
Blinding of participants and personnel (performance bias) Subjective outcome measures	Low risk	There were no subjective outcome measures

Wang 2014 (*Continued*)

Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Participants were blinded; blinding of personnel not described, however the review authors judge that the outcome measurement is not likely to be influenced by lack of blinding
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Quote: "A blinded rater measured safety, hand function, and cortical excitability before and after treatment"
Incomplete outcome data (attrition bias) Subjective outcome measures	Low risk	There were no subjective outcome measures
Incomplete outcome data (attrition bias) Objective outcome measures	Unclear risk	All participants apparently completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	Unclear risk	All outcomes listed in the methods section reported

Wu 2013a

Methods	Study design: RCT with parallel-group design Dropouts: none Adverse effects: none Deaths: none ITT: yes Duration: 1 month
Participants	Country: China Number of participants: 90 Age: mean (SD) C-tDCS: 45.9 (11.2), sham tDCS 49.3 (12.6) years Gender: C-tDCS: 34 (76%) male, sham tDCS: 35 (78%) male Type of stroke: C-tDCS: 27 (60%) ischaemic, sham tDCS: 26 (58%) ischaemic Time poststroke in months: mean (SD) C-tDCS: 4.9 (3.0); sham tDCS 4.9 (2.9) Severity: FMA for C-tDCS: 12 (4 to 26) and 8 (3 to 34), BI for C-tDCS 55 (0 to 85) and 55 (25 to 95) for sham tDCS Inclusion criteria: time since stroke > 2 months, first-ever stroke, muscle tone at wrist and elbow with MAS score $\geq$ 1 and $\leq$ 3, no history of Botox or other invasive treatment in the previous 6 months, use of spasmolytics resulting in an adverse event or maximised dosing without effect and no severe cognitive or mood disorders Exclusion criteria: unstable vital signs or unstable, progressive or severe neurological disease, heart condition or hypertension

Wu 2013a (*Continued*)

Interventions	2 arm 1. Physical therapy twice daily for 30 minutes each, C-tDCS over M1 lesioned (1.2 mA for 20 minutes once daily, 5 days per week for 4 weeks) 2. Physical therapy twice daily for 30 minutes each, sham tDCS over M1 lesioned (1.2 mA for 30 seconds once daily, 5 days per week for 4 weeks)
Outcomes	Outcomes used: MAS (range from 0 to 4, with a score of 4 reflecting the highest possible muscle tone), UE-FM (0 to 66, with higher scores reflecting better motor performance) and MBI (0 to 105, with higher scores reflecting better ADL performance) Time points of measurement: at baseline, at the end of the intervention period and at 4-week follow-up
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Subjects were randomly assigned using a computer-generated randomisation list by a single investigator"
Allocation concealment (selection bias)	Low risk	Quote: "The assigned random number was inputted into the stimulator device by the same investigator. She did not participate in other parts of the study. The device automatically generated active or sham tDCS according to the parity of the random number"
Blinding of participants and personnel (performance bias) Subjective outcome measures	Low risk	Quote: "All other investigators, subjects, and outcome assessors remained blinded to group allocation until the completion of the final statistical analyses"
Blinding of participants and personnel (performance bias) Objective outcome measures	Low risk	Quote: "All other investigators, subjects, and outcome assessors remained blinded to group allocation until the completion of the final statistical analyses"
Blinding of outcome assessment (detection bias) Subjective outcome measures	Low risk	Quote: "All other investigators, subjects, and outcome assessors remained blinded to group allocation until the completion of the final statistical analyses"
Blinding of outcome assessment (detection bias) Objective outcome measures	Low risk	Quote: "All other investigators, subjects, and outcome assessors remained blinded to group allocation until the completion of

Wu 2013a (*Continued*)

		the final statistical analyses"
Incomplete outcome data (attrition bias) Subjective outcome measures	Low risk	All participants completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Incomplete outcome data (attrition bias) Objective outcome measures	Low risk	All participants completed the study. No treatment withdrawals, no losses to follow-up, no trial group changes and no major adverse events were stated
Selective reporting (reporting bias)	Low risk	All outcomes from the methods section and from the published trial protocol were reported

A-tDCS: anodal transcranial direct current stimulation
AMT: active motor threshold
ARAT: Action Research Arm Test
ASS: Ashworth Spasticity Score
AT: arm robotic training
BBT: Box and Block Test
BI: Barthel Index
C-tDCS: cathodal transcranial direct current stimulation
CIMT: constraint-induced movement therapy
DLPFC: Dorsolateral prefrontal cortex
EEG: electroencephalography
ESS: European Stroke Scale
FAC: Functional Ambulation Category
FDI: first dorsal interosseous muscle
FMA: Fugl-Meyer Assessment
iTBS: intermittent theta burst stimulation
ITT: intention-to-treat analysis
JTT: Jebsen Taylor Hand Function Test
LTP: Long-term potentiation
M1: primary motor cortex
mA: milliampere
MAL: Motor Activity Log Rating Scale
MAS: Modified Ashworth Scale
MBI: Modified Barthel Index
MCA: middle cerebral artery
MEP: motor-evoked response
MI: Motricity Index
MI-BCI: motor imagery brain-computer interface
MIT: Massachusetts Institute of Technology
MMSE: Mini Mental State Examination
MP: methylphenidate
MRC: Medical Research Council

MRI: magnetic resonance imaging
NIHSS: National Institute of Health Stroke Scale
NMDA: *N*-methyl-D-aspartate
NRS: Numerical Rating Scale
OMCASS: Orgogozo MCA scale
PPC: posterior parietal cortex
PPT: Purdue Pegboard Test
RCT: randomised controlled trial
ROM: range of motion
RMI: Rivermead Mobility Index
RMT: resting motor threshold
SD: standard deviation
SIS: Stroke Impact Scale
tDCS: transcranial direct current stimulation
TUG: Timed Up and Go Test
UE-FM: Upper Extremity Fugl-Meyer Score
WMFT: Wolf Motor Function Test

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

Study	Reason for exclusion
Boggio 2007b	Not a genuine RCT
Bradnam 2012	Not a genuine RCT
Byblow 2011	Not a genuine RCT, irrelevant outcome: motor evoked potential
Celnik 2009	Outcome number of correct key presses clinically not relevant
Danzl 2012	Sham group was stimulated more than 1 minute
Edwards 2009	Not a genuine RCT
Gandiga 2006	Not a genuine RCT
Giacobbe 2013	Irrelevant outcome measure movement kinematics
Goh 2015	Irrelevant Outcome: motor evoked potential
Gurchin 1988	Irrelevant intervention: transcranial alternating current stimulation
Hummel 2005a	Not a genuine RCT
Hummel 2005b	Not a genuine RCT
Jayaram 2009	Irrelevant outcome for review question 'motor evoked potentials'

(*Continued*)

Kasashima 2012	Irrelevant outcome for review question 'event-related desynchronisation'
Kharchenko 2001	Irrelevant Intervention for review question 'transcranial alternating current stimulation'
Kitisomprayoonkul 2012	Irrelevant outcome for review question 'sensation'
Kumar 2011	Irrelevant intervention for review question: study did not evaluate impact of tDCS on upper limb/lower limb function and/or ADLs
Kwon 2012	Not a genuine RCT
Lee 2012	Irrelevant patients
Lefebvre 2013	Not a genuine randomised controlled cross-over trial
Lefebvre 2015	Not a genuine randomised controlled cross-over trial
Madhavan 2011	Irrelevant outcome for review question 'accuracy index'
Manganotti 2011	Not a genuine RCT
Ochi 2013	Irrelevant comparison for review question: A-tDCS versus C-tDCS with no control group
Paquette 2011	Irrelevant intervention for review question: tDCS was contaminated with rTMS at each stimulation session
Sheliakin 2006	Not a genuine RCT
Stagg 2012a	Irrelevant outcome for review question 'response time'
Takeuchi 2012	Irrelevant outcome for review question 'bimanual co-ordination', as measured by tapping task
Zimerman 2012	Not a genuine randomised controlled cross-over trial

A-tDCS: anodal transcranial direct current stimulation
ADLs: activities of daily living
C-tDCS: cathodal transcranial direct current stimulation
RCT: randomised controlled trial
rTMS: repetitive transcranial magnetic stimulation
tDCS: transcranial direct current stimulation

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

Brem 2010

Methods	Not clearly stated by the study authors
Participants	3 right-handed participants with acute stroke (< 5 weeks)
Interventions	A-tDCS at 1 mA for 20 minutes twice a day on 5 consecutive days
Outcomes	UE-FM, NHPT
Notes	Conference abstract only

Miller 2013

Methods	Randomised sham-controlled cross-over trial
Participants	20 chronic stroke patients with residual upper limb motor deficits
Interventions	Each participant underwent either A-tDCS, C-tDCS or sham tDCS separated by a two week resting period
Outcomes	Outcomes were assessed at baseline and after every treatment session 1. JTT (arm and hand function) 2. Hand-held dynamometer (grip strength, pinch force)
Notes	Conference abstract only

Park 2014

Methods	Randomised sham-controlled cross-over study
Participants	17 chronic stroke patients (5 (29%) female; mean age 59 years; 12 (71%) had ischaemic stroke)
Interventions	Each participant underwent all of the following conditions 1. C-tDCS over M1 of the unaffected hemisphere (dosage not described) plus 10 Hz rTMS over M1 of the affected hemisphere 2. A-tDCS over M1 of the unaffected hemisphere (dosage not described) plus 10 Hz rTMS over M1 of the affected hemisphere 3. Sham tDCS over M1 of the unaffected hemisphere (dosage not described) plus 10 Hz rTMS over M1 of the affected hemisphere
Outcomes	Outcome measures 1. Change of MEP amplitude (cortical excitability) 2. Sequential motor task (hand motor function)
Notes	Conference abstract only

A-tDCS: anodal transcranial direct current stimulation

C-tDCS: cathodal transcranial direct current stimulation
Hz: hertz
JTT: Jebsen-Taylor test
M1: primary motor cortex
mA: milliampere
MEP: Motor Evoked Potentials
NHPT: Nine-Hole Peg Test
rTMS: repetitive transcranial magnetic stimulation
UE-FM: Upper Extremity Fugl-Meyer Assessment

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

ACTRN12613000109707

Trial name or title	A pilot investigation of the effect of cathodal transcranial direct current stimulation (ctDCS) plus standard upper limb rehabilitation to augment motor recovery post acute stroke
Methods	RCT with blinded outcome assessor ITT analysis: yes
Participants	37 to 40 people between 18 and 80 years of age with acute first-ever ischaemic stroke (in the first week) and moderate to severe hemiparesis (UE-FM $\leq$ 52) with MEPs detectable by TMS, stable blood pressure parameters and MMSE > 24 Exclusion criteria: pre-existing upper limb impairment causing functional limitation, hemiplegic shoulder pain, metallic implants (pacemaker or artificial cochlea), history of seizure or another unstable medical condition, pregnancy, severe language disturbance, English as a second language, severe neglect (score < 44 out of 54 points on the Star Cancellation test), history of depression, alcohol or drug abuse, coexistent neurological or psychiatric disease, current treatment with antidepressants, antipsychotics or benzodiazepines or current treatment with Na^+ or Ca^{2+} Channel blockers or NMDA receptor antagonists
Interventions	10 rehabilitation sessions (30 minutes each) to the affected arm over a period of 2 weeks (i.e. 5 days of treatment, 2 days rest, 5 days of treatment) + 1 of the following interventions: 1. Experimental: C-tDCS to the non-lesioned hemisphere 2. Sham comparator: sham tDCS to the non-lesioned hemisphere
Outcomes	All assessments are to be completed at baseline and at 1 day, 2 weeks and 3 months after the end of the intervention Primary outcome measure: UE-FM change scores Secondary outcome measures: MEP as measured by TMS, NIHSS, Tardieu Spasticity Assessment, FIM, PostStroke Depression Scale
Starting date	4 February 2013
Contact information	Ms Jimena Garcia-Vega, jimena.garcia-vega@health.wa.gov.au
Notes	

Chelette 2012

Trial name or title	Not stated by the authors
Methods	Randomised sham-controlled double-blind trial
Participants	Estimated enrolment: 44 participants with severe upper extremity motor deficit due to chronic stroke
Interventions	Every participant is randomly assigned to 1 of 4 arms, consisting of 10 tDCS-treatment sessions, followed by 3 hours of OT: 1. A-tDCS to excite ipsilesional hemisphere 2. C-tDCS to inhibit contralesional hemisphere 3. Dual-tDCS as a simultaneous combination of anodal and C-tDCS 4. Sham tDCS
Outcomes	UE-FM at baseline and postintervention ARAT SIS
Starting date	Not stated by the study authors
Contact information	University of Kentucky, Lexington, KY
Notes	

ChiCTR-TRC-11001398

Trial name or title	Effect of transcranial direct current stimulation on recovery of upper limb function after stroke
Methods	Randomised controlled pilot trial in parallel-group design Random sequence generation: computer software Blinding: participants, study staff and outcome assessors are blinded
Participants	120 people with first-time ever stroke and upper limb hemiplegia in the first 3 months after stroke, spasticity at the wrist and elbow (MAS $\leq$ 1) and no history of spasmolytics
Interventions	Experimental 1: physical therapy + active tDCS Sham comparator: physical therapy + sham tDCS
Outcomes	Brunnstrom stages, FMA, BI, MAS, ARAT
Starting date	1 July 2011
Contact information	Dongyu Wu, wudongyu73@yahoo.com.cn
Notes	

ChiCTR-TRC-11001490

Trial name or title	Using transcranial direct current stimulation to treat ataxia and balance impairment after stroke
Methods	Randomised controlled pilot trial in parallel-group design Random sequence generation: computer software Blinding: participants, study staff and outcome assessors are blinded
Participants	40 people with first-time ever stroke and upper limb hemiplegia in the first 3 months after stroke and lesions involving the cerebellum without obvious cerebral edema Exclusion criteria: unstable vital signs; depression after stroke; severe aphasia; obvious cognition dysfunction (MMSE < 24); serious vision or vision correction anomalies; or history of vertigo attack; hearing impairment or otitis media
Interventions	Experimental 1: balance and intervention training + active tDCS Sham comparator: balance and intervention training + sham tDCS
Outcomes	Biodex Balance System, International Cooperative Ataxia Rating Scale, BBS, BI
Starting date	1 August 2011
Contact information	Dongyu Wu, wudongyu73@yahoo.com.cn
Notes	

NCT00542256

Trial name or title	Effects of transcranial direct current stimulation coupled with constraint-induced movement therapy on motor function in stroke patients
Methods	Double-blind RCT
Participants	50 people 18 to 80 years of age with radiologically confirmed first-time ever ischaemic or haemorrhagic stroke; at least 6 months prior to study enrolment, demonstrating adequate balance with the non-lesioned arm restraint and the ability to stand up from sitting and to stand without help of the upper extremity Exclusion criteria: significant prestroke disability, neuropsychological impairments that hinder motor testing, considerable joint pain in the paretic extremity, life expectancy less than 1 year because of terminal medical diagnosis, advanced disease of viscera, considerable neurological or psychiatric disease, history of substance abuse, use of neuropsychotropic drugs, inability to enrol in another study targeting stroke recovery, prior admittance of CIMT or tDCS
Interventions	Experimental group: 40 minutes of tDCS over M1 at the beginning of 10 of 14 consecutive up to 6 hours lasting CIMT training sessions Control group: 30 seconds of tDCS over M1 at the beginning of 10 of 14 consecutive up to 6 hours lasting CIMT training sessions
Outcomes	Primary outcome measures: Jebsen Taylor Hand Function Test at baseline, training days 1, 5, and 10 and follow-up; Motor Activity Log Rating Scale at baseline, training days 1, 5, and 10 and follow-up; Beck Depression Inventory at baseline, training days 1, 5, and 10 and follow-up; Visual Analogue Scale for Anxiety at baseline, training days 1, 5, and 10 and follow-up Secondary outcome measures: Fugl-Meyer Assessment of Motor Recovery at baseline; Barthel Index Score at

NCT00542256 (*Continued*)

	baseline; Modified Ashworth Scale at baseline
Starting date	September 2007
Contact information	Julie A Williams, MSc 617-667-5261 jawillia@bidmc.harvard.edu
Notes	Last updated: 9 May 2008

NCT00783913

Trial name or title	Enhancing the beneficial effects of upper extremity visuomotor training with tDCS
Methods	Double-blind RCT in a parallel-group design
Participants	18 people 18 to 85 years of age with ability to sit and be active for an hour on a chair/wheelchair without cardiac, respiratory and/or pain disturbances as assessed during the screening visit; willingness to commit to participate in the long-term follow-up study (up to 3 months); willingness to give written informed consent; diagnosis of a first clinically apparent unilateral cortical or subcortical stroke at least 3 months before study entry Exclusion criteria: history of severe neurological illness, severe cognitive impairment (MMSE < 23); MRI contraindications; history of alcohol or drug abuse; active depression with psychoactive medication changes in the last 2 months, active psychosis, disruptive or violent behavior, poor motivational capacity; aphasia or language disturbances that would interfere with performance of study tasks; uncontrolled medical problems; increased intracranial pressure; severe neglect or ataxia that would interfere with completion of study tasks; history of more than one stroke or a stroke that affects both sides of the brain, the brainstem or the cerebellum; inflammation of the tissue, severe rheumatoid arthritis or abnormal function of the joints due to arthritis in the affected arm used most often; pregnancy
Interventions	Baseline intervention: 1-hour computerised movement training and tDCS sessions twice a day, 5 days a week, for 3 weeks. Participants will sit in front of a computer screen that shows a target (round dots) and a cursor (a line). Participants will be instructed to move the cursor to various targets on the computer screen as fast and as accurately as possible, while controlling the position of the cursor by moving their arm, which will rest on a mechanical device Experimental: A-tDCS stimulation during the first 20 minutes of each training session; electrode sponges soaked in tap water are placed on the scalp and forehead Control: sham tDCS
Outcomes	Primary outcome measures: accuracy (defined as the difference between the straight line connecting the origin and the target and the line followed by the participant) during reaching. 1 of the additional outcomes is the time to complete a reaching task Secondary outcome measures: UE-FM
Starting date	October 2008
Contact information	National Institutes of Health Clinical Center, 9000 Rockville Pike, Bethesda, Maryland, USA

NCT00783913 (*Continued*)

Notes	

NCT00853866

Trial name or title	Enhancement of motor function with reboxetine and transcranial direct current stimulation (STIMBOX)
Methods	Randomised sham-controlled double-blind cross-over trial
Participants	12 people with stroke between 18 and 86 years of age, able to give informed consent, with first-ever ischaemic stroke at least 6 months before study enrolment and paresis of arm/hand muscles above 3 on MRC scale Exclusion criteria: multiple cerebral lesions with associated residual deficits, severe head trauma, seizures, ferromagnetic implants in the head/neck region, pacemaker, other psychiatric or neurological diseases, substance abuse, inability to give informed consent, contraindications for reboxetine (seizures, glaucoma, prostate hyperplasia with urinary retention, cardiac arrhythmias, potential interactions with comedication), pregnancy and breast-feeding
Interventions	Experimental group 1: reboxetine + active tDCS: single dose of reboxetine/edrona × 4 mg 80 minutes before assessment of JTT + 20 minutes of 1 mA tDCS during JTFHT assessment with the active electrode over M1 of the lesioned hemisphere Experimental group 2: reboxetine + sham tDCS: single dose of reboxetine/edrona × 4 mg 80 minutes before assessment of JTT + 30 seconds of 1 mA tDCS during JTFHT assessment with the active electrode over M1 of the lesioned hemisphere Experimental group 3: placebo drug + active tDCS: placebo 80 minutes before assessment of JTT + 20 minutes of 1 mA tDCS during JTFHT assessment with the active electrode over M1 of the lesioned hemisphere Experimental group 4: placebo drug + sham tDCS: placebo 80 minutes before assessment of JTT + 30 s of 1 mA tDCS during JTFHT assessment with the active electrode over M1of the lesioned hemisphere
Outcomes	Primary outcome measures: Jebsen Taylor Test at 4 different sessions with 4 different interventions Secondary outcome measures: maximum grip force at 4 different sessions with 4 different interventions; Nine-Hole Peg Test at 4 different sessions with 4 different interventions
Starting date	January 2009
Contact information	Contact: GianpieroLiuzzi, MD +49 40 7410 ext 59278 g.liuzzi@uke.de Contact: Christian Gerloff, MD + 49 40 7410 ext 53770 gerloff@uke.de
Notes	Last updated: 1 December 2010

NCT00909714

Trial name or title	Neuroregeneration enhanced by tDCS in stroke
Methods	Double-blind RCT (parallel assignment)
Participants	250 people aged 18 years and older with subacute stroke (5 to 21 days after stroke), ischaemic subcortical or cortical first-ever strokes and moderate to moderately severe upper extremity hemiparesis (UE-FM between 28 and 50) Exclusion criteria: more than 1 stroke; progressive stroke; completely lesioned hand knob area of M1 affected, cerebellar lesions, history of severe alcohol or drug abuse, psychiatric illnesses such as severe depression, poor motivational capacity or severe language disturbances, or with serious cognitive deficits; severe uncontrolled medical problems; rheumatological or traumatic diseases affecting the upper extremities; other neurological diseases; severe microangiopathy, polyneuropathy, ischaemic peripheral disease; pregnancy; contraindication for MRI or TMS
Interventions	Baseline intervention: standardised upper extremity rehabilitative training; A-tDCS (20 minutes) or sham tDCS will be applied once a day in combination with standardised upper extremity rehabilitative training Experimental: tDCS once a day for 20 minutes + baseline (polarity and dosage not stated) Control: sham tDCS + baseline
Outcomes	Primary outcome measures: UE-FM at 12 months after the end of the intervention period Secondary outcome measures: JTT, ARAT, 9-HPT, SIS, UE-FM at days 11, 40, 100 and 190 after the end of intervention period and at 12 months after the end of the intervention period
Starting date	July 2009
Contact information	Friedhelm Hummel, Dr f.hummel@uke.uni-hamburg.de Christian Gerloff, Prof Dr gerloff@uke.uni-hamburg.de
Notes	

NCT01007136

Trial name or title	TDCS-enhanced stroke recovery and cortical reorganisation
Methods	Double-blind randomised controlled trial in parallel-group design
Participants	150 people with single ischaemic stroke between 18 and 80 years of age with arm weakness between 5 and 15 days poststroke and no other neurological or psychiatric diseases Exclusion criteria: people with bilateral motor impairment, with poor motivational capacity or history of severe alcohol or drug abuse, people with severe aphasia, MMSE Score < 23; people with severe uncontrolled medical problems (e.g. seizures, progressive stroke syndromes, severe rheumatoid arthritis, active joint deformity of arthritic origin, active cancer or renal disease, end-stage pulmonary or cardiovascular disease, a deteriorated condition due to age or others); people with unstable thyroid disease; people with increased intracranial pressure; people with unstable cardiac arrhythmia; people with contraindication to TMS or tDCS stimulation (pacemaker, an implanted medication pump, a metal plate in the skull, or metal objects inside the eye or skull, patients who had a craniotomy, skin lesions at the site of stimulation); people who are not available for follow-up at 3 and 12 months; pregnancy; people with contraindication to MRI will not participate in MRI

NCT01007136 (*Continued*)

Interventions	Experimental: tDCS and occupational therapy: 1 mA electrical current will be delivered over M1 of the lesioned hemisphere for the first 20 minutes during the 1-hour physical therapy Sham comparator: sham and occupational therapy: electrical current will be ramped up and down over M1 of the lesioned hemisphere for the first seconds during the 1 hour physical therapy
Outcomes	Primary outcome measures: UE-FM at 2 weeks, 3 months and 1 year after stroke Secondary outcome measures: JTT at 2 weeks, 3 months and 1 year after stroke; WMFT at 2 weeks, 3 months and 1 year after stroke; MRC grading scale at 2 weeks, 3 months and 1 year after stroke; BI at 2 weeks, 3 months and 1 year after stroke; Abilhand questionnaire at 2 weeks, 3 months and 1 year after stroke; Ashworth Spasticity Scale at 2 weeks, 3 months and 1 year after stroke; Beck Depression Inventory at 2 weeks, 3 months and 1 year after stroke; Visual Analog Pain Scale at 2 weeks, 3 months and 1 year after stroke; Mini Mental Status Scale at 2 weeks, 3 months and 1 year after stroke; NIHSS at 2 weeks, 3 months and 1 year after stroke; Motor Activity Log at 2 weeks, 3 months and 1 year after stroke; fMRI overactivation in motor cortex: voxel count and intensity at 2 weeks, 3 months and 1 year after stroke
Starting date	March 2009
Contact information	Timea Hodics, MD Timea.Hodics@UTSouthwestern.edu Charlotte Bentley Charlotte.Bentley@UTSouthwestern.edu
Notes	

NCT01014897

Trial name or title	tDCS in chronic stroke recovery-pilot
Methods	Double-blind randomised sham-controlled cross-over trial
Participants	45 people between 18 and 80 years of age with single symptomatic stroke more than 3 months ago with hand/arm weakness and ability to perform required tests and provide consent; Modified Ashworth scale < 3; ROM functional at shoulder, elbow, wrist and hand Exclusion criteria: more than 1 symptomatic stroke in MCA territory or bilateral involvement; severe medical or psychiatric conditions, drug abuse, seizure disorder; pregnancy/breast-feeding; SAH, lobar haemorrhage; people who cannot have tDCS (prior head surgery, pacemakers, metallic implants in the head, etc); people taking antiadrenergic medications
Interventions	Experimental: subcortical: subcortical stroke participants will receive tDCS stimulation and sham in random order; tDCS and sham will be applied in random order during standardised occupational therapy Experimental: cortical: participants will receive active and sham tDCS in random order; tDCS and sham will be applied in random order during standardised occupational therapy
Outcomes	Primary outcome measures: WMFT at baseline and after the end of the intervention period; UE-FM at baseline and after the end of the intervention period Secondary outcome measures: adverse events during the intervention period
Starting date	April 2009

NCT01014897 (*Continued*)

Contact information	Timea Hodics, MD Timea.Hodics@UTSouthwestern.edu
Notes	

NCT01127789

Trial name or title	Use of transcranial direct current stimulation (tDCS) to study implicit motor learning on people with brain injury
Methods	Double-blind RCT (parallel assignment)
Participants	Enrolment: 0 People 18 to 65 years of age with TBI or stroke participants with partially preserved fine motor function Exclusion criteria: with metal clips in head or device (e.g. pacemaker); active CNS drugs
Interventions	Experimental: non-invasive brain stimulation (both anodal and C-tDCS will be used)
Outcomes	Primary outcome measures: reaction time (millisecond) of a serial reaction time task at 24 hours postintervention Secondary outcome measures: error rate (percentage) of a serial reaction time task at 24 hours postintervention
Starting date	March 2010
Contact information	Wen-Shiang Chen, MD, PhD Department of Physical Medicine and Rehabilitation, NTUH, Taipei, Taiwan, 100
Notes	Withdrawn prior to enrolment

NCT01143649

Trial name or title	Effects of transcranial DC stimulation coupled with constraint induced movement therapy on motor function in stroke patients
Methods	Double-blind RCT (parallel-group design)
Participants	120 people between 18 and 90 years of age: 40 of whom have first-time ever clinical ischaemic or haemorrhagic cerebrovascular accident confirmed by a radiological or physician's report, with weakness less than 55 (out of 66) on the UE-FM scale; stroke onset > 6 months before study enrolment. The remaining 80 people are healthy volunteers Exclusion criteria: significant prestroke disability, major depression; any substantial decrease in alertness, language reception, or attention that might interfere with understanding instructions for motor testing; excessive pain in any joint of the paretic extremity (not applicable to severe stroke patients), contraindications to single pulse TMS (TMS will be used to measure cortical excitability); contraindications to tDCS, advanced liver, kidney, cardiac or pulmonary disease; terminal medical diagnosis consistent with survival < 1 year; coexistent major neurological or psychiatric disease; history of significant alcohol or drug abuse in the prior 6 months; use of carbamazepine and amitriptyline; patients may not be actively enrolled in a separate intervention study targeting stroke recovery and prior CIMT and/or tDCS treatment for stroke; history of epilepsy before stroke;

NCT01143649 (*Continued*)

	patients with global aphasia and deficits of comprehension; pregnancy
Interventions	Experimental 1: tDCS + CIMT in stroke participants (40 people), tDCS over M1; intensity 1 mA, for the first 40 minutes of 10 consecutive sessions of CIMT (Monday to Friday) Experimental 2: tDCS + motor training in healthy participants (40 people); 1 day of treatment (when the order in which they receive sham or active tDCS stimulation will be randomly assigned). Each stimulation day will include up to 6 hours of training termed "shaping" in the non-dominant hand, while the dominant hand is restrained in a resting hand splint and is secured in a sling. At the start of this training, participants will undergo 40 minutes of real tDCS at 1 mA or sham tDCS Active comparator: tACS 40 healthy participants, 1 day of treatment (when the order in which they receive sham or active transcranial alternating current stimulation (tACS) stimulation will be randomly assigned), stimulated at 1 mA for 40 minutes
Outcomes	Primary outcome measures: motor function as measured by JTT, MAS, UE-FM, BI at 2 weeks after the end of the intervention period Secondary outcome measures: cortical excitability measured by MEP and the resting motor threshold, intracortical excitability by paired-pulse and also transcallosal inhibition to measure interhemispheric differences
Starting date	April 2010
Contact information	Location: Spaulding Rehabilitation Hospital, Boston, Massachusetts, 02114, USA Investigator: Felipe Fregni, PhD
Notes	

NCT01169181

Trial name or title	AMES + brain stimulation: treatment for profound plegia in stroke
Methods	Not clearly stated
Participants	Estimated enrolment: 6 Inclusion criteria: age 18 to 75 years; stroke more than 1 year prior to enrolment; hemispheric stroke; residual upper-extremity weakness without the ability to activate finger extension volitionally Exclusion criteria: significant upper-extremity proprioceptive deficit; cortical stroke involving M1; unstable epilepsy; Botox injections less than 5 months prior to enrolment; use of intrathecal Baclofen; residual pain in the affected arm; significant neglect involving the affected limb; exercise intolerance; uncontrolled hypertension or angina; cognitive or behavioural inability to follow instructions; terminal illness; severe apraxia; circumference of arm incompatible with the AMES device; contractures, decreased range of motion, or skin condition preventing tolerance of the AMES device (Assisted Motion with Enhanced Sensation); spinal cord injury; arthritis or fractures of affected limbs, decreasing range of motion; peripheral nerve injury or neuropathy in the affected arm resulting in significant motor or sensory loss; other neurological comorbidities; implanted devices; previous vascular surgery on brain or heart blood vessels; pregnancy
Interventions	2 arms 1. 30 sessions of AMES therapy plus rTMS (20 minutes each) over a 10- to 15-week period 2. 30 sessions of AMES therapy plus tDCS (20 minutes each) over a 10- to 15-week period

NCT01169181 (*Continued*)

Outcomes	Outcomes will be recorded at baseline Primary outcome 1. Maximum volitional EMG in extensor digitorum and the finger flexors Secondary outcome 1. CMSA
Starting date	July 2010
Contact information	Jau-Shin Lou, MD PhD Oregon Health and Science University Portland, Oregon, United States, 97239
Notes	

NCT01201629

Trial name or title	Does transcranial direct current stimulation (tDCS) improve functional motor recovery in the affected arm-hand in patients after an acute ischemic stroke? Pilot study
Methods	Double-blind RCT (parallel-group design)
Participants	50 people 19 to 90 years of age with unilateral, first-time ever acute ischaemic stroke within 4 weeks of admission to an inpatient rehabilitation facility and severe upper limb weakness (MRC < 2), medically stable from a cardiorespiratory standpoint so that they can participate in daily therapies, with ability to give informed consent Exclusion criteria: haemorrhagic stroke, patients with an episode of poststroke seizure or history of epilepsy; medically unstable, demented, or terminally ill patients; spasmolytics and medications known to enhance motor recovery such as d-amphetamine, implanted pacemakers and defibrillators and refusal to provide informed consent
Interventions	Experimental: tDCS + OT, 1 mA of tDCS will be delivered through surface electrodes (25 to 35 cm^2) to the unaffected motor cortex for 30 minutes before a participant's scheduled OT Sham comparator: tDCS + OT, stimulation for 30 seconds only
Outcomes	Primary outcome measures: total Functional Independence Measure after 4 weeks of therapy Secondary outcome measures: ARAT after 4 weeks of therapy
Starting date	January 2009
Contact information	Meheroz H Rabadi, MD, MRCPI rabadimh@gmail.com
Notes	

NCT01207336

Trial name or title	Effect of combined anodal tDCS and peripheral nerve stimulation on motor recovery in acute stroke
Methods	Double-blind RCT (parallel assignment)
Participants	20 people 35 to 85 years of age with first-ever ischaemic stroke within 5 to 30 days; paresis of the arm/hand with NIHSS < 15 Exclusion criteria: pregnancy, psychiatric history, history of substance abuse or severe depression, severe language disturbances, patients with increased intracranial pressure or serious cardiac disease, patients with contraindication to TMS
Interventions	Experimental: 1 session of A-tDCS (1.2 mA for 13 minutes) to the ipsilesional primary motor cortex (M1) combined with peripheral radial nerve electrical stimulation (rEPNS) to the paretic hand repeated on 5 successive days, rEPNS (at radial nerve 5 Hz), 0.7* motor threshold Sham: the same rEPNS regimen as in the experimental group but combined with sham tDCS
Outcomes	Primary outcome measures: Jebsen Taylor test at 5, 15 and 30 days Secondary outcome measures: grip and wrist force at 5, 15 and 30 days; Nine-Hole Peg Test at 5, 15 and 30 days; cortical excitability of ipsilesional M1 (as measured by TMS) at 5, 15 and 30 days
Starting date	September 2010
Contact information	Marion Simonetta-Moreau, MD, PhD simonetta.m@chu-toulouse.fr
Notes	

NCT01356654

Trial name or title	The use of transcranial direct current stimulation in the recovery of postural control in stroke
Methods	Double-blind randomised controlled cross-over trial
Participants	34 people 18 to 75 years of age, suffering from a stroke in the MCA region, during subacute phase (4 to 24 weeks after onset), hospitalised in rehabilitation Hospital Hof Ter Schelde, Antwerp, Belgium, capable of understanding and giving informed consent Exclusion criteria: cerebellum or brainstem lesions, recent multiple lesions and older lesions manifested clinically, history of severe substance abuse (alcohol, drugs, benzodiazepines), cardiac diseases that in the opinion of the clinician preclude participation in the trial (e.g. severe dyspnoea in rest, severe rhythm disturbances), history of epileptic insults not caused by the stroke, severe organic comorbidity, history of psychiatric disorders, pacemaker/internal defibrillator, pregnancy
Interventions	Experimental: tDCS, 20 minutes, 4 times a week for 4 weeks Sham comparator: sham TDCS, 20 minutes, 4 times a week for 4 weeks
Outcomes	Primary outcome measures (at baseline, after one month and after two months): Trunk Impairment Scale (change score); RMAB; Tinetti test
Starting date	March 2010

NCT01356654 (*Continued*)

Contact information	Wim Saeys, MSc, wim.saeys@hotmail.com
Notes	

NCT01414582

Trial name or title	Transcranial direct current stimulation (tDCS) as a potential adjunct intervention in stroke rehabilitation
Methods	Double-blind RCT (parallel assignment)
Participants	80 people 18 to 80 years of age who are willing and able to give informed consent for participation in the study and who should be at least 6 months post first symptomatic stroke affecting motor function of the hand Exclusion criteria: no adequate understanding of verbal and written information in English, sufficient to complete any of the safety screening forms, previous history of epilepsy, history of drug abuse or a previous history of a neurological or psychiatric illness, or a history of neurosurgical procedure; prescription of medications such as antidepressants, took or taking of antimalarial treatment in the last 72 hours, pregnancy, metallic implant in the neck, head, or eye; any implanted electrical devices, claustrophobia, more than one stroke, limited communication in the form of aphasia or a history of dementia
Interventions	Baseline intervention: standardised motor training intervention for the upper paretic limb Experimental group: baseline Intervention and A-tDCS over the M1 of the ipsilesional hemisphere, stimulation intensity of 1 mA for the first 20 minutes of motor training (9 consecutive sessions from Monday to Friday) Sham comparator: baseline Intervention and sham tDCS over M1 of the ipsilesional hemisphere for the first 20 minutes of motor training (9 consecutive sessions from Monday to Friday)
Outcomes	Primary outcome measures: UE-FM, WMFT, ARAT, Nine-Hole Peg Test Secondary outcome measures: Reaction Time Test, SIS All assessed at 2 separate baseline sessions (at least 1 week apart), and then again immediately after the end of the intervention period (day 10), 1 week, 1 month and 3 months after the end of the intervention period
Starting date	January 2011
Contact information	Heidi Johansen-Berg, Prof, heidi@fmrib.ox.ac.uk
Notes	

NCT01500564

Trial name or title	Functional Interest of non invasive brain stimulation during physiotherapy at a subacute phase post stroke (anodal protocol)
Methods	Double-blind RCT (parallel-group design)
Participants	20 people 18 to 80 years of age; participants volunteer to participate in the study, with written informed consent, affiliation with a national health insurance program, first-time ever clinical ischaemic or haemorrhagic cerebrovascular accident as evidenced by a radiological (or physician's) report, contralesional motor deficit

NCT01500564 (*Continued*)

	with a lesion sparing M1, stroke onset > 1 month and < 6 months before study enrolment Exclusion criteria: coexistent major neurological or psychiatric disease, history of epilepsy before stroke, substantial decrease in alertness, language reception, or attention that might interfere with understanding instructions for motor testing; patients with global aphasia and deficits of comprehension, excessive pain in any joint of the paretic extremity (VAS > 4), contraindications to tDCS such as metal in the head, implanted brain medical devices, history of significant substance abuse in the prior 6 months, antimalarial treatment in the last 72 hours, no prior CIMT/tDCS treatment for stroke; pregnancy
Interventions	Baseline intervention: 20 minutes of motor training during physiotherapy in 10 consecutive sessions (Monday to Friday) during 2 weeks Experimental: baseline intervention + A-tDCS over M1 of the ipsilesional hemisphere; stimulation intensity of 1 mA Sham comparator: baseline intervention + sham tDCS over the M1 of the ipsilesional hemisphere
Outcomes	Primary outcome measures: UE-FM (change score from baseline to 2 weeks after the end of the intervention period) Secondary outcome measures (change score from baseline to 2 weeks after the end of the intervention period, 2 weeks, 1 month, 3 months and 6 months later): FIM, MAL, JTT, BBT, MAS, muscle strength as measured by MRC
Starting date	December 2011
Contact information	Sophie Jacquin-Courtois, MD, sophie.courtois@chu-lyon.fr
Notes	

NCT01503073

Trial name or title	Noninvasive brain stimulation for stroke improvement
Methods	Double-blind RCT cross-over trial
Participants	200 persons 18 to 90 years of age with acute or chronic stroke (and with a slight deficit at least) Exclusion criteria: epilepsy, contraindication to tDCS and/or to fMRI, inability to understand/complete behavioural tasks, history of substance abuse, major health condition, presence of pacemaker, pregnancy
Interventions	Active comparator: tDCS Sham comparator: sham tDCS
Outcomes	Primary outcome measures: change in function before/after tDCS, any brain function impaired by stroke Secondary outcome measures: change in neuroimaging and neurophysiological outcome measures before/after tDCS: (1) noninvasive neuroimaging: brain activity studied by means of fMRI, (2) noninvasive neurophysiological measure: TMS, EEG, evoked potentials, EMG Time points of their measurement: before intervention, immediately after intervention, 10, 20, 30, 40, 50, 60 minutes after intervention; long-term after intervention: 1, 2, 3 and 4 weeks and 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 months after the end of the intervention period
Starting date	January 2008

NCT01503073 (*Continued*)

Contact information	Yves Vandermeeren, MD, PhD, yves.vandermeeren@uclouvain.be
Notes	

NCT01519843

Trial name or title	Post-stroke procedural learning: from neural substrates to therapeutic modulation by non-invasive brain stimulation
Methods	Double-blind randomised controlled cross-over trial
Participants	200 people 18 to 95 years of age with chronic stroke with an at least slight deficit Exclusion criteria: epilepsy, contraindication to tDCS and/or to fMRI, inability to understand/complete behavioural tasks, history of substance abuse, major health condition, presence of pacemaker, pregnancy
Interventions	Active comparator: tDCS Placebo comparator: sham tDCS
Outcomes	Primary outcome measures: motor learning improvement with tDCS from baseline to 4 weeks after the end of the intervention period as measured by a motor skill learning task and by Purdue Pegboard, hand dynamometer, pinch dynamometer, 9-HPT Secondary outcome measures: neuroimaging before motor learning task, during motor learning and after (immediately, 30 minutes, 60 minutes) motor learning; neurophysiological outcome measure (of brain excitability and connectivity with TMS (single and paired pulse)) 5 minutes before motor learning, just at the end of motor learning, after 30 minutes of motor learning, after 60 minutes of motor learning and at 1, 2, 3, and 4 weeks after the day of intervention
Starting date	September 2010
Contact information	Yves Vandermeeren, MD, PhD, yves.vandermeeren@uclouvain.be
Notes	

NCT01539096

Trial name or title	Brain stimulation-aided stroke rehabilitation: neural mechanisms of recovery
Methods	Double-blind RCT (parallel-group design)
Participants	30 people 21 years of age and older diagnosed with a stroke that occurred at least 6 months ago Exclusion criteria: pregnancy, ongoing use of CNS-activating medications, presence of an electrically, magnetically or mechanically activated implant, including cardiac pacemaker or cochlear implants, metal in the head, history of medication-resistant epilepsy in the family, history of seizures or unexplained spells of loss of consciousness
Interventions	Baseline intervention: CIMT for 3 days a week for 5 weeks for 1 hour each day. Participants will also be asked to use their affected hand in daily activities at home for 5 hours a day while wearing a mitt on the unaffected

NCT01539096 (*Continued*)

	hand Experimental: baseline intervention + tDCS to areas of the brain responsible for movement of the affected hand Sham comparator: baseline intervention + sham tDCS with a similar setup to that for the active tDCS
Outcomes	Primary outcome measures: change in upper limb function at baseline during intervention (on average 2.5 weeks from baseline) and at 5 weeks at the end of the intervention period Secondary outcome measures: study of change in neural mechanisms that underlie the complementary association of cortical stimulation and CIMT
Starting date	July 2011
Contact information	Ela B Plow, PhD, PT, plowe2@ccf.org Alexandria Wyant, wyanta@ccf.org
Notes	

NCT01544699

Trial name or title	Impact of non-invasive brain stimulation on motor recuperation
Methods	Double-blind randomised controlled cross-over trial
Participants	200 people 18 to 90 years of age with chronic stroke (> 6 months after stroke) and at least a slight deficit in upper or lower limb Exclusion criteria: epilepsy, contraindication to tDCS and/or to fMRI, inability to understand/complete behavioural tasks, history of substance abuse, major health condition, presence of pacemaker, pregnancy
Interventions	Active comparator: tDCS Sham comparator: sham tDCS
Outcomes	Primary outcome measures: change in motor function of upper/lower limb before/after tDCS from baseline to immediately after intervention (30 minutes of tDCS) to 10, 20, 30, 40, 50, 60 minutes after intervention and long-term after intervention: 1, 2, 3, and 4 weeks
Starting date	January 2012
Contact information	Yves Vandermeeren, MD, PhD, yves.vandermeeren@uclouvain.be
Notes	

NCT01574989

Trial name or title	Effects of repetitive transcranial magnetic stimulation and transcranial DC stimulation on motor function in stroke patients
Methods	Double-blind randomised controlled cross-over trial
Participants	26 people 18 to 90 years of age Additional inclusion criteria for stroke participants: first-time ever clinical ischaemic or haemorrhagic cerebrovascular events as evidenced by a radiological (or physician's) report; weakness, defined as score of less than 55 (out of 66) on UE-FM scale; stroke onset > 6 months before study enrolment Exclusion criteria: history of major depression, BDI > 30, any substantial decrease in alertness, language comprehension, or attention that might interfere with understanding instructions for motor testing; contraindications to TMS/tDCS; advanced liver, kidney, cardiac or pulmonary disease; terminal medical diagnosis consistent with survival < 1 year; coexistent major neurological or psychiatric disease, history of significant substance abuse in the prior 6 months, patients may not be actively enrolled in a separate intervention study targeting stroke recovery and any other clinical trials, patients with global aphasia and deficits of comprehension, pregnancy, neuropsychotropic medication (healthy people only) Additional exclusion criteria for stroke patients: patients may not have already received TMS and/or tDCS stimulation for stroke, history of epilepsy before stroke or episodes of seizures within the last 6 months
Interventions	Participants will receive 5 sessions of stimulation. They will undergo (1) active low-frequency rTMS (1 Hz continuous), (2) active high-frequency rTMS (10 Hz, 2-second trains with intertrain interval of 28 seconds) or (3) sham rTMS (using a sham coil). Each session will last 20 minutes and will be conducted at 100% of the motor threshold. Each tDCS session will last 20 minutes and will be conducted using 1 mA with 35 cm^2 electrodes Experimental 1: single session of active low-frequency rTMS/sham tDCS on the scalp during the 20-minute session Experimental 2: single session of active high-frequency rTMS/sham tDCS on the scalp during the 20-minute session Experimental 3: single session of sham rTMS/active anodal tDCS on the scalp during the 20-minute session Experimental 4: single session of sham rTMS/active C-tDCS on the scalp during the 20-minute session Sham comparator: single session of sham rTMS/sham tDCS on the scalp during the 20-minute session
Outcomes	Primary outcome measures: changes in cortical excitability measures using single- and paired-pulse TMS before and after each single stimulation session Secondary outcome measures: changes in motor function as measured by behavioural tasks (e.g. Purdue pegboard, JTT, ROM) both before and after the stimulation sessions Time frame: measured for approximately 6 weeks
Starting date	May 2011
Contact information	Felipe Fregni, MD, PhD, MPH, ffregni@partners.org Kayleen M Weaver, BA, kmweaver@partners.org
Notes	

NCT01644929

Trial name or title	Rehabilitation combined with bihemispheric transcranial direct current stimulation in subacute ischemic stroke to increase upper limb motor recovery: a randomised, controlled, double-blind study (RECOMBINE)
Methods	Double-blind randomised controlled cross-over trial (multicentre)
Participants	36 people 18 years of age or older with subcortical or subcortical/cortical ischaemic lesions in the territory of MCA, as confirmed by neuroimaging in the subacute phase (2 to 4 weeks after stroke) with persistent hemiparesis (score of 1 to 3 on the motor arm item of the NIH Stroke Scale (NIHSS) but wrist and finger movement is not required) and no upper extremity injury or conditions that limited its use before the stroke; subscription of informed consent Exclusion criteria: history of epilepsy, brain tumour, major head trauma, learning disorder, severe cognitive impairment, drug or alcohol abuse, major psychiatric illness. Use of medications that may lower seizure threshold (e.g. metronidazole, fluoroquinolones), severe pain in the affected upper limb ($\geq$ 8 on the shoulder item of the "joint pain during passive motion" of the UE-FM); recurrent stroke or other significant medical complications during the study; evidence of severe leucoencephalopathy (grade IV according to Fazeka's scale) ; significant aphasia that would impair understanding and performance on assessment scales
Interventions	Each participant receives standardised physical/occupational treatment according to the Impairment-Oriented Training, plus 1 of the following treatment schemes: 1. Experimental 1: A-tDCS of the ipsilesional motor cortex and C-tDCS of the contralesional motor cortex (1.5 mA, 30 minutes) for 15 days during 3 weeks, then sham stimulation for 30 seconds on 15 days during 3 weeks 2. Experimental 2: sham tDCS for 30 seconds on 15 days during 3 weeks, then A-tDCS of the ipsilesional motor cortex and C-tDCS of the contralesional motor cortex (1.5 mA, 30 minutes) for 15 days during 3 weeks 3. Sham comparator: treatment for 6 weeks daily with sham tDCS for 30 seconds on 15 days during 6 weeks
Outcomes	Primary outcome measures: UE-FM at the end of the intervention period Secondary outcome measures: UE-FM at 3 weeks and at 6 months; BI at 3 weeks, at 6 weeks and at 6 months; Ashworth scale at 3 weeks, at 6 weeks and at 6 months; Test of Upper Limb Apraxia (TULIA) at 6 weeks and at 6 months; grip strength at 3 weeks, at 6 weeks and at 6 months; Hamilton Depression Rating Scale at 6 weeks and at 6 months
Starting date	September 2012
Contact information	Carlo Cereda, MD, Carlo.Cereda@eoc.ch René Müri, MD, rene.mueri@insel.ch
Notes	

NCT01726673

Trial name or title	Effects of transcranial direct current stimulation paired with robotic arm therapy on recovery of upper extremity motor function in stroke patients
Methods	Double-blind RCT (parallel assignment)

NCT01726673 (*Continued*)

Participants	66 people 18 years of age or older with first single focal unilateral lesion as verified by brain imaging at least 6 months after stroke, with cognitive function sufficient to understand experiments and follow instructions; FMA of 7 to 58 out of 66 (neither hemiplegic nor fully recovered motor function in the muscles of the shoulder, elbow and wrist) Exclusion criteria: Botox treatment within 6 weeks of enrolment, fixed contraction of the affected limb, complete flaccid paralysis of the affected limb, history of haemorrhagic stroke, ongoing use of CNS active or psychoactive medications, presence of additional potential tDCS/TMS risk factors, including damaged skin at the site of stimulation, presence of a magnetically/mechanically active implant, metal in the head, family history of epilepsy and personal history of seizures
Interventions	Experimental arm: tDCS + robotic arm therapy, 2 mA for 20 minutes over M1 in the lesioned hemisphere, followed by robotic arm therapy for 60 minutes, 3 times per week for 12 weeks Placebo comparator arm: sham tDCS + robotic arm therapy (0 mA) for 20 minutes over M1 in the lesioned hemisphere, followed by robotic arm therapy for 60 minutes, 3 times per week for 12 weeks
Outcomes	Primary outcome measures: change from baseline in UE-FM at the end of the intervention period and at 6 months of follow-up Secondary outcome measures: change from baseline in kinematic data (upper extremity mobility as measured by Interactive Motion Technologies planar (shoulder/elbow) robot and wrist (wrist flexion/extension and pronation/supination) robots during therapy and evaluations) at the end of the intervention period and at 6 months of follow-up; change from baseline in WMFT at the end of the intervention period and at 6 months of follow-up; change from baseline Motor Power Manual Muscle Test at the end of the intervention period and at 6 months of follow-up; change from baseline NIH stroke scale at the end of the intervention period and at 6 months of follow-up; change from baseline SIS at the end of the intervention period and at 6 months of follow-up
Starting date	September 2012
Contact information	Bruce T Volpe, MD, bvolpe1@nshs.edu Johanna Chang, MS, jchang14@nshs.edu
Notes	

NCT01807637

Trial name or title	Using transcranial direct current stimulation to jump start gait training in chronic stroke patients
Methods	RCT with parallel-group design
Participants	Estimated enrolment: 88 Inclusion criteria: stroke > 3 months prior to enrolment; unilateral stroke; MRI-confirmed; age > 30 years; complete NIHSS; sufficient endurance motor ability and balance to ambulate at least 10 meters; ankle dorsiflexion passive ROM > 0°; demonstrating foot-drop during ambulation such that gait instability or inefficient gait patterns are exhibited; pass the TMS Adult Safety Screen (TASS) Exclusion criteria: oedema; skin breakdown; absent sensation of the affected lower limb, which interferes with the peroneal nerve stimulator; serious cardiac arrhythmia; pacemakers or any other implanted electronic systems; pregnancy; uncontrolled seizures; Parkinson's Disease; spinal cord injury, traumatic brain injury; multiple sclerosis; fixed ankle plantar flexor contracture; history of dementia, severely impaired cognition,

NCT01807637 (*Continued*)

	communication or comprehension; severe or frequent headaches; history of BOTOX injection within 3 months prior to enrolment; receiving other forms of electrical stimulation; other medical conditions or medications that compromise ambulation or balance; PI's or Medical Monitor's discretion not to include a participant
Interventions	2 arms 1. A-tDCS over the low extremity representation of M1 of the affected hemisphere (dosage not stated) 2. Sham tDCS over the low extremity representation of M1 of the affected hemisphere (30 seconds)
Outcomes	Outcomes will be recorded at baseline, at 1 week, 1 month and at 6 months postintervention Primary outcome measures 1. Change from baseline in ankle dorsiflexion during the swing phase of gait Secondary outcome measures 1. Change from baseline in slope of cortical recruitment curve 2. Change from baseline in SIS scores
Starting date	March 2013
Contact information	Chad I Lairamore, PhD; chadl@uca.edu University of Central Arkansas Conway, Arkansas, United States, 72035
Notes	

NCT01828398

Trial name or title	tDCS and robotic therapy in stroke
Methods	RCT with parallel-group design
Participants	Estimated enrolment: 40 Inclusion criteria: age > 18 years; first-ever ischaemic stroke; impairment of the upper limb; TCT score > 50 Exclusion criteria: insufficient understanding in Italian to complete any test; MMSE-score < 24; contraindications to single-pulse TMS; history of epilepsy; frequent headaches or neck pain; implanted devices; contraindications to tDCS; neurological or psychiatric pathology; severe cardio-pulmonary, renal, hepatic diseases; pregnancy
Interventions	2 arms 1. Dual-tDCS with the anode placed over M1 of the affected hemisphere and the cathode placed over M1 of the unaffected hemisphere (1 mA for 30 min) plus robotic therapy (5 times a week for 30 minutes for 2 weeks) 2. Sham tDCS (not explicitly described) plus robotic therapy (5 times a week for 30 minutes for 2 weeks)
Outcomes	Outcomes will be recorded at baseline (further time points not stated) Primary outcome measure: 1. UE-FM Secondary outcome measures 1. BBT

NCT01828398 (*Continued*)

	2. MAS 3. MAL 4. Cortical excitability
Starting date	November 2011
Contact information	Sofia Straudi, MD University Hospital of Ferrara Ferrara, Italy
Notes	

NCT01879787

Trial name or title	Impact of transcranial direct current stimulation (tDCS) on the effects of mental practice and modified constraint-induced movement therapy (mCIMT) in the rehabilitation of chronic stroke patients
Methods	RCT with parallel-group design
Participants	Estimated enrolment: 84 Inclusion criteria: aged between 40 and 80 years; stroke > 6 months prior to enrolment; MMSE $\geq$ 20; $\leq$ 3 Ashworth Scale; $\leq$ 4 Visual Analogue Pain Scale Exclusion criteria: multiple brain lesions; medication for treatment of spasticity; attention deficit; inability to follow instructions; pregnancy; pacemaker; metal implant in the head; history of convulsion; epilepsy
Interventions	7 arms 1. A-tDCS with the anode placed over M1 of the lesioned hemisphere (1 mA for 13 minutes) after 30 minutes of physiotherapy and lastly 45 minutes modified CIMT including 6 hours restraint of the paretic limb at home (mCIMT) 3 times per week for 10 sessions 2. C-tDCS with the cathode placed over M1 of the non-lesioned hemisphere (1 mA for 9 minutes) after 30 minutes of physiotherapy and lastly 45 minutes modified CIMT including 6 hours restraint of the paretic limb at home (mCIMT) 3 times per week for 10 sessions 3. Dual-tDCS with the anode placed over M1 of the lesioned hemisphere and the cathode placed over M1 of the non-lesioned hemisphere (1 mA for 13 minutes) after 30 minutes of physiotherapy and lastly 45 minutes modified CIMT including 6 hours restraint of the paretic limb at home (mCIMT) 3 times per week for 10 sessions 4. Sham tDCS with the anode placed over M1 of the lesioned hemisphere (1 mA for 30 seconds) after 30 minutes of physiotherapy and lastly 45 minutes modified CIMT including 6 hours restraint of the paretic limb at home (mCIMT) 3 times per week for 10 sessions 5. tDCS during mental practice after 30 minutes of physiotherapy 3 times per week for 10 sessions 6. Sham tDCS during mental practice after 30 minutes of physiotherapy 3 times per week for 10 sessions 7. 30 minutes of physiotherapy 3 times per week for 10 sessions
Outcomes	Outcomes will be recorded at baseline and at 1 and 2 months Primary outcome measures 1. Change in UE-FM Secondary outcome measures 1. Change in JTT

NCT01879787 (*Continued*)

Starting date	January 2011
Contact information	Kátia K Monte Silva, PhD Universidade Federal de Pernambuco Recife, Pernambuco, Brazil, 50740-560
Notes	

NCT01883843

Trial name or title	Efficacy of a task-oriented circuit training associated with transcranial direct current stimulation (tDCS) for gait improvement in chronic stroke patients. A randomised controlled trial
Methods	RCT with parallel-group design
Participants	Estimated enrolment: 21 Inclusion criteria: aged between 18 and 75 years; diagnosis of first-ever ischaemic stroke > 6 months prior to enrolment; MMSE > 24; FAC $\geq$ 4 Exclusion criteria: contraindications to tDCS; neurological or psychiatric pathology; severe cardio-pulmonary, renal or hepatic disease; pregnancy
Interventions	2 arms 1. A-tDCS over the lower leg area of M1 of the lesioned hemisphere (0.5 mA for 15 minutes) for 10 consecutive days after rehabilitation treatment in the gym 2. Sham tDCS over the lower leg area of M1 of the lesioned hemisphere (0.5 mA for 20 seconds) for 10 consecutive days after rehabilitation treatment in the gym
Outcomes	Outcomes will be recorded at baseline, at 1 week after treatment end and at 3 months follow-up Primary outcome measure: 1. Change in 6MWT Secondary outcome measures: 1. TUG 2. UBS 3. FSS 4. SIS 3.0 5. SS-QOL
Starting date	May 2013
Contact information	Sofia Straudi, MD Ferrara Rehabilitation Hospital Ferrara, Italy, 44124
Notes	

NCT01897025

Trial name or title	Combined transcranial direct current stimulation and motor imagery-based robotic arm training for stroke rehabilitation - a feasibility study
Methods	RCT with parallel-group design
Participants	Estimated enrolment: 32 Inclusion criteria: first-ever stroke more than 9 months prior to study enrolment; upper extremity impairment of 11 to 45 on the Fugl-Meyer assessment scale Exclusion criteria: epilepsy; neglect; cognitive impairment; other neurological or psychiatric diseases; severe arm pain; spasticity score > 2 MAS in shoulder/elbow joint; contraindications to TMS or tDCS; grip strength < 10 kg as measured by dynamometer; participation in other interventions or trials targeting motor recovery
Interventions	2 arms 1. A-tDCS with the anode placed over M1 of the affected hemisphere and the cathode placed over M1 of the unaffected hemisphere (1 mA for 20 minutes) followed by MI-BCI training with the MIT-Manus for 40 minutes (10 sessions over 2 weeks) 2. Sham tDCS with the anode placed over M1 of the affected hemisphere and the cathode placed over M1 of the unaffected hemisphere (1 mA for 30 seconds) followed by MI-BCI training with the MIT-Manus for 40 minutes (10 sessions over 2 weeks)
Outcomes	Outcomes will be recorded at baseline, at the end of intervention period and 4 weeks after the end of intervention period Primary outcome measure 1. UE-FM Secondary outcome measures 1. Resting Motor Threshold of M1 of the affected hemisphere 2. Grip strength 3. BBT 4. MRI parameters
Starting date	January 2011
Contact information	Effie Chew, MD National University Hospital Singapore, Singapore, 119074
Notes	

NCT01945515

Trial name or title	Robotic-assisted gait training combined with transcranial direct current stimulation to maximize gait recovery after stroke: a double-blind, randomised, controlled trial
Methods	RCT with parallel-group design
Participants	Estimated enrolment: 34 Inclusion criteria: aged above 18 years; stroke diagnosis confirmed by CT or MRI; hemiplegia due to unilateral lesion; time since stroke from 1 to 8 weeks; inability to ambulate independently Exclusion criteria: unstable vital signs; history of seizure or cranial operation; premorbid inability to ambulate;

NCT01945515 (*Continued*)

	bilateral hemispheric stroke; metallic implants; MMSE < 10; severe aphasia
Interventions	2 arms 1. A-tDCS with the anode placed over the lower limb area of M1 of the lesioned hemisphere (2 mA for 30 minutes) during robot-assisted gait training plus overground gait training with a physical therapist for 30 minutes per day plus , 5 times a week for 2 weeks 2. Sham tDCS with the anode placed over the lower limb area of M1 of the lesioned hemisphere (2 mA for 1 minute) during robot-assisted gait training plus overground gait training with a physical therapist for 30 minutes per day, 5 times a week for 2 weeks
Outcomes	Outcomes will be recorded at baseline Primary outcome measures: not stated Secondary outcome measures: not stated
Starting date	September 2013
Contact information	Han Gil Seo, MD Seoul National University Hospital Seoul, Korea, Republic of, 110-744
Notes	

NCT01969097

Trial name or title	Efficacy basics of bihemispheric motorcortex stimulation after stroke
Methods	RCT with parallel-group design
Participants	Estimated enrolment: 50 Inclusion criteria: aged between 18 and 80 years; chronic stroke (> 6 months after stroke) Exclusion criteria: more than 1 stroke; severe alcohol disease or drug abuse; severe psychiatric disease like depression or psychosis; severe cognitive deficits; severe untreated medical conditions; other neurologic diseases; severe microangiopathy; pregnancy
Interventions	3 arms 1. Dual-tDCS plus motor training (25 minutes/day) for 5 days 2. A-tDCS plus motor training (25 minutes/day) for 5 days 3. Sham tDCS plus motor training (25 minutes/day) for 5 days
Outcomes	Outcomes will be recorded at baseline and at the end of intervention period Primary outcome measures 1. Change in motor function of the affected upper extremity after the end of intervention period 2. Change in motor function of the affected upper extremity at 3-months follow-up Secondary outcome measures 1. Motor function of the affected upper extremity after the end of intervention period 2. Motor function of the affected upper extremity at 3-months follow-up 3. fMRI at the end of intervention period and at 3-months follow-up 4. DTI at the end of intervention period and at 3-months follow-up

NCT01969097 (*Continued*)

	5. TMS at the end of intervention period
Starting date	May 2012
Contact information	Robert Lindenberg, M.D. Charite Universitätsmedizin Berlin Berlin, Germany, 10117
Notes	

NCT01983319

Trial name or title	Transcranial direct current stimulation combined with constraint induced movement therapy and role of GABA activity in stroke recovery
Methods	RCT with parallel-group design
Participants	Estimated enrolment: 64 Inclusion criteria: age between 18 and 80 years; stroke > 3 months prior to enrolment; > 10° mobility in the wrist, thumb and fingers of the affected side; ability to move, stand up and stand firmly with constraint healthy hand; ability to perform training 6 hours daily in 2 weeks; being able to understand instructions and to co-operate Exclusion criteria: contraindication to MRI of the brain; pregnancy; epilepsy, major psychiatric diseases; excessive pain, preventing treatment; history of other diseases resulting in decreased mobility of affected upper limb
Interventions	3 arms 1. A-tDCS over upper extremity representation of M1 (1.5 mA for 30 minutes) during CIMT for 10 consecutive daily sessions on workdays 2. Sham tDCS over upper extremity representation of M1 (dosage not described) during CIMT for 10 consecutive daily sessions on workdays 3. No Intervention (20 healthy age-matched control participants will undergo MRI spectroscopy of the brain)
Outcomes	Primary outcome measures (measured at baseline and at the end of intervention) 1. Change in WMFT 2. Change in UE-FM Secondary outcome measures 1. GABA activity (at baseline) 2. BBT after single session of tDCS
Starting date	September 2013
Contact information	Krystian Figlewski, MD Regionhospital Hammel Neurocenter, Research Unit Hammel, Denmark, 8450
Notes	

NCT02031107

Trial name or title	Randomized controlled trial of transcranial theta-burst stimulation and transcranial direct current stimulation in subacute stroke
Methods	RCT with parallel-group design
Participants	Estimated enrolment: 45 Inclusion criteria: unilateral stroke with resulting deficits in motor function and significantly impaired activities in daily living at enrolment Exclusion criteria: epilepsy; metal in the head; implants; pregnancy; sleep deprivation; recent traumatic brain injury; delirium or disturbed vigilance; inability to participate in 1 hour treatment sessions; severe language comprehension deficits; skull breach; recurrent stroke during rehabilitation; medical complications
Interventions	3 arms 1. C-tDCS over the motor cortex of the unaffected hemisphere (25 minutes) 3 times per week for 3 weeks during upper extremity sessions 2. Continuous Theta Burst Stimulation (cTBS) over the motor cortex of the unaffected hemisphere (200 bursts, each consisting of three pulses at 30 Hz, repeated at inter-burst intervals of 167 ms); 2 stimulation trains of 30 seconds (separated by 15 minutes) will be applied 3 times per week for 3 weeks immediately after physical therapy 3. half of the participants will receive sham cTBS and half will receive sham tDCS
Outcomes	Primary outcome measures 1. Change in compound motor score slope at week 4 (UE-FM, 9-HPT, Jamar dynamometer strength normalised to the healthy arm and averaged to a compound motor score) 2. Change in alpha-band coherence between affected motor cortex and the rest of the brain Secondary outcome measures 1. Change in UE-FM at week 4 2. Change in UE-FM at week 8 3. Change in alpha-band coherence between the unaffected motor cortex and the rest of the brain 4. Change in MAL at week 4 5. Change in MAL at week 8 6. Number of adverse events at week 4 7. Number of adverse events at week 8 8. Other outcome measures: 9. Total UE-FM at week 4 10. Total UE-FM at week 8 11. Change in average velocity in pegs/sec at week 4 12. Change in average velocity in pegs/sec at week 8 13. Change in Jamar dynamometer strength at week 4 14. Change in Jamar dynamometer strength at week 8 15. Change in score of the BBT at week 4 16. Change in score of the BBT at week 8 17. Correlation between change in alpha-band coherence and clinical improvements at week 4 18. Change in fractional anisotropy of the affected corticospinal tract at week 4 19. Change in correlations of spontaneous fMRI fluctuations within the motor network
Starting date	September 2013

NCT02031107 (*Continued*)

Contact information	Adrian G Guggisberg, MD Service de Neurorééducation, Unversity Hospital Geneva, Switzerland, 1211
Notes	

NCT02080286

Trial name or title	Boosting the therapeutic benefits of prism adaptation by combining it with tDCS
Methods	Randomised cross-over trial
Participants	Estimated enrolment: 40 Inclusion criteria: aged 18 to 85 years; right-hemispheric stroke at least 1 month prior to enrolment;diagnosis of neglect confirmed by the Behavioural Inattention Test (BIT) Exclusion criteria: adequate understanding of English, sufficient to give informed consent; limited verbal communication in the form of dysphasia; history of drug abuse; history of dementia or other psychiatric conditions
Interventions	3 arms 1. A-tDCS over the left/unaffected M1 (1 mA for 20 minutes) on 5 consecutive daily sessions during prism adaptation therapy 2. Sham tDCS over the left/unaffected M1 (1 mA for 20 minutes) on 5 consecutive daily sessions during prism adaptation therapy 3. prism adaptation therapy (20 minutes) on 5 consecutive daily sessions during prism adaptation therapy
Outcomes	Primary outcome measures 1. BIT (at week 0 and at week 8) 2. Neglect Test Battery (at baseline and at weeks 1, 2, 4 and 8) Secondary outcome measure: 1. Changes in brain imaging data (at baseline and at week 5)
Starting date	February 2014
Contact information	Jacinta O'Shea FMRIB Centre, John Radcliffe Hospital, University of Oxford Oxford, United Kingdom, OX3 9DU
Notes	

NCT02109796

Trial name or title	A controlled, randomised study evaluating the immediate effect of one tDCS session on quadriceps strength in hemiparetic patients
Methods	Randomised cross-over trial

NCT02109796 (*Continued*)

Participants	Estimated enrolment: 30 Inclusion criteria: written informed consent; stroke > 6 months prior to enrolment; hemiparesis; ability to walk with or without technical assistance; following rehabilitation program for lower limbs Exclusion criteria: patient with bilateral brain lesion; cerebellar syndrome; apraxia; aphasia; previous orthopedic surgery in paretic lower limb (< 6 months); usual tDCS contraindications; pregnancy
Interventions	No detailed information provided except the following quotation: "We test a new electrode configuration: a anodal stimulation opposite to the cortical representation area of the injured hemisphere and a simultaneous stimulation opposite to the homonyme the cortical representation area of the healthy hemisphere. We hypothesis that one session of tDCS with this electrode configuration allow to improve paretic quadriceps strength in hemiparetic patients after stroke."
Outcomes	Outcomes will be recorded at baseline and 2 hours after the end of intervention Primary outcome measure 1. Maximum voluntary strength of knee extensors Secondary outcome measures 1. Resistive peak torque during passive knee flexion 2. Angle related to the resistive peak torque generation of the knee extensors 3. Amplitude of the interpolation twitch 4. EMG activation of the knee flexors and extensors during the strength evaluations (active and passive) 5. Functional evaluation of the gait performance and balance
Starting date	February 2015
Contact information	Roche Nicolas, MD PH Raymond Poincare Hospital Garches, France, 92380
Notes	

NCT02156635

Trial name or title	A double-blind, sham-controlled, randomised clinical trial on stroke treatment using transcranial direct current stimulation
Methods	RCT with parallel-group design
Participants	Estimated enrolment: 40 Inclusion criteria: aged between 18 and 65 years; acute ischaemic stroke; informed consent Exclusion criteria: NIHSS between 25 and 32; Rankin $\geq$ 5; MMSE $\leq$ 24; use of drugs changing CNS excitability; metallic implants; seizures; pregnancy; other conditions interfering with CIMT criteria; inability to voluntarily execute wrist flexion, 10° of finger extension and 20° of wrist extension
Interventions	2 arms 1. Active tDCS plus CIMT daily for 10 consecutive working days 2. Sham tDCS plus CIMT daily for 10 consecutive working days

NCT02156635 (*Continued*)

Outcomes	Primary outcome measure 1. BI (at 4 months) Secondary outcome measures 1. MoCA (at baseline and at the end of intervention period) 2. Victoria version of the Stroop Color and Word Test (at baseline and at the end of intervention period) 3. Digit span test (at baseline and at the end of intervention period) 4. Spasticity (at baseline and at the end of intervention period) 5. Muscle strength (at baseline and at the end of intervention period) 6. Balance (at baseline and at the end of intervention period) 7. Posture (at baseline and at the end of intervention period) 8. Fear of falling during daily life activities (at baseline and at the end of intervention period) 9. Upper limb function (at baseline and at the end of intervention period) 10. Quality of Life (at baseline and at the end of intervention period) 11. Lower limb function (at baseline and at the end of intervention period)
Starting date	June 2014
Contact information	Suellen Marinho Andrade, MSc Federal University of Paraíba, Department of Psychology João Pessoa, Paraíba, Brazil, 58051-900
Notes	

NCT02166619

Trial name or title	Transcranial direct current stimulation in rehabilitation of chronic stroke patients: multicenter clinical trial
Methods	Randomised controlled trial with parallel-group design
Participants	Estimated enrolment: 24 Inclusion criteria: age between 40 and 80 years; primary or recurrent stroke, confirmed by CT or MRI; stroke > 12 months prior to enrolment; upper limb impairment due to stroke; MMSE $\geq$ 18; Ashworth Scale $\geq$ 4; minimal active wrist movement (flexion and extension); at least one pinch movement Exclusion criteria: prior neurological diseases; multiple brain lesions; metal implant in the head; pacemaker; history of seizures; epilepsy; pregnancy; haemodynamic instability; cointervention of physical therapy elsewhere during the study; initial UE-FM > 59; traumatic or orthopaedic lesion limiting the range of motion of the upper limb
Interventions	2 arms 1. Dual-tDCS with the anode over the affected hemisphere and the cathode over the unaffected hemisphere (2 mA for 20 minutes) followed by 40 minutes of physical therapy 5 times per week for 2 weeks 2. Sham tDCS with the anode over the affected hemisphere and the cathode over the unaffected hemisphere (2 mA for 20 minutes) followed by 40 minutes of physical therapy 5 times per week for 2 weeks
Outcomes	Outcomes will be recorded at baseline and at days 30 and 90 Primary outcome measure: 1. Change in UE-FM Secondary outcome measures:

NCT02166619 (*Continued*)

	1. Change in MAL-30 2. Other outcome measures: 3. Change in JTT
Starting date	December 2013
Contact information	Kátia Monte-Silva, PhD Déborah Marques, PT Applied Neuroscience Laboratory, Universidade Federal de Pernambuco Recife, PE, Brazil, 50670-900
Notes	

NCT02209922

Trial name or title	The effects of tDCS combined with balance training on postural control and spasticity in chronic stroke patients (a randomised controlled trial)
Methods	RCT with parallel-group design
Participants	Estimated enrolment: 40 Inclusion criteria: age between 18 and 80 years; first ischaemic MCA stroke > 6 months prior to enrolment; Romberg test > 30 seconds Exclusion criteria: haemorrhagic stroke; other neurological conditions affecting balance
Interventions	2 arms 1. Active tDCS (2 mA for 20 minutes) and simultaneous balance training (10 to 15 minutes) for 5 consecutive days 2. Sham tDCS and simultaneous balance training for 5 days
Outcomes	Outcomes will be recorded at baseline and 1 week after the end of intervention Primary outcome measures 1. BBS 2. Linear and nonlinear approximate entropy outcome measures for COP Secondary outcome measures 1. MAS 2. H-reflex
Starting date	December 2014
Contact information	Fariba Yadolahi ShahidBeheshti Univesity of Medical sciences Tehran, Iran, Islamic Republic of, 1616931111
Notes	

NCT02210403

Trial name or title	The Influence of tDCS on the arm and hand function in stroke patients
Methods	Randomised cross-over trial
Participants	Estimated enrolment: 26 Inclusion criteria: age above 18 years; stroke onset > 6 months prior to enrolment; first-ever stroke; decreased hand and arm function; MMSE > 24 Exclusion criteria: depression; pregnancy; alcohol abuse; aneurysm clips; pacemaker; neurostimulator; implemented defibrillator; magnetically activated implant or device; implemented pump; spinal cord stimulator; implemented hearing aid; artificial or prosthetic limb; metal parts in the body; any external or internal metal; artificial heart valve; other implants; history of brain surgery migraine; family history of epilepsy
Interventions	2 arms 1. Dual-tDCS plus upper limb motor training 2. Sham tDCS plus upper limb motor training
Outcomes	Outcomes will be recorded at baseline, at the 3rd intervention day and at 1 week postintervention Primary outcome measure 1. Change in UE-FM Secondary outcome measure 1. Change in MAS Other outcome measure 1. Change in motor task performance
Starting date	April 2013
Contact information	Xue Zhang K U Leuven Leuven, Belgium, 3000
Notes	

NCT02213640

Trial name or title	Potentiation of the effects of prismatic adaptation by transcranial direct current stimulation (tDCS): evaluation of functional interest in negligence rehabilitation
Methods	RCT with parallel-group design
Participants	Estimated enrolment: 24 Inclusion criteria: age between 18 and 80; right-handedness; unilateral neglect due to right-hemispheric stroke, radiologically confirmed; hospitalised in the Department of Physical Medicine and Rehabilitation or external monitoring; diagnosis of negligence as indicated by BIT score $\leq$ 129; stroke > 1 month prior to enrolment Exclusion criteria: degenerative neurological condition; uncontrolled epilepsy; temporo-spatial disorientation; language disorders or psychiatric disorders interfering with understanding instructions; history of prior stroke; multiple stroke; unstable medical condition; pregnancy; implanted materials; unweaned alcoholism

NCT02213640 (*Continued*)

Interventions	2 arms 1. A-tDCS over M1 (1 mA for 20 minutes) plus prismatic adaptation on 5 consecutive sessions 2. Sham tDCS over M1 plus prismatic adaptation on 5 consecutive sessions
Outcomes	Outcomes will be recorded at baseline, at the end of intervention (5 weeks) and 2, 6 and 15 weeks after the end of intervention Primary outcome measure 1. BIT Secondary outcome measures: 1. BTN 2. Functional independence scale (MIF) 3. Cahterine Bergego Scale (ECB) 4. Jamar dynamometer
Starting date	September 2014
Contact information	Sophie Jacquin-Courtois, MD-PhD Laurent Villeneuve, CRA Hospices Civils de Lyon
Notes	

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	Randomised controlled trial with parallel-group design
Participants	Estimated enrolment: 80 Inclusion criteria: first stroke in cortical regions; time since stroke > 6 months prior to enrolment; initial UE-FM score between 24 to 52; MAS $\leq$ 2 in any joints of the affected arm; MMSE $\geq$ 24; willing to sign the informed consent Exclusion criteria: aphasia interfering with understanding instructions; visual/attention impairments that might interfere with the seeing of mirror illusion, including hemineglect/hemianopsia; currently participation in any other research; previous brain neurosurgery; metallic implants within the brain
Interventions	4 arms 1. Active tDCS (1.5 mA for 20 minutes) followed by mirror therapy (40 minutes) and functional training (30 minutes) during the first 2 weeks, and 60 minutes pure mirror therapy followed by 30 minutes functional training during the last 2 weeks 2. Sham tDCS (20 minutes) followed by mirror therapy (40 minutes) and functional training (30 minutes) during the first 2 weeks, and 60 minutes pure mirror therapy followed by 30 minutes functional training during the last 2 weeks 3. Mirror therapy for 60 minutes per session followed by 30 minutes functional training 4. 60 minutes conventional stroke rehabilitation intervention followed by 30 minutes functional training

NCT02254616 (*Continued*)

Outcomes	Primary outcome measures 1. Change in UE-FM (at baseline, 2, 4, 16 and 28 weeks) 2. Change in WMFT (at baseline, 2 and 4 weeks) 3. Change in MAL (at baseline, 2, 4, 16 and 28 weeks) 4. Change in rNSA (at baseline and 4 weeks) Secondary outcome measures 1. Change in AAP (at baseline, 4, 16 and 28 weeks) 2. Change in 10MWT (at baseline and 4 weeks) 3. Change in actigraphy (at baseline and 4 weeks) 4. Change in kinematic analysis (at baseline and 4 weeks) 5. Change of hand strength (at baseline, 2 and 4 weeks) 6. Change of Stroop Test (at baseline and 4 weeks) 7. Change of pressure pain threshold (at baseline and 4 weeks)
Starting date	August 2014
Contact information	Ching-Yi Wu, ScD Chang Gung Memorial Hospital Kwei-Shan, Tao-Yuan, Taiwan, 333
Notes	

NCT02292251

Trial name or title	Study to enhance motor acute recovery with intensive training after stroke
Methods	RCTwith factorial assignment
Participants	Estimated enrolment: 72 Inclusion criteria: age over 21 years; first or recurrent ischaemic stroke < 5 weeks prior to enrolment, confirmed by CT or MRI; residual unilateral arm weakness with UE-FM between 6 and 40; informed consent; ability to understand the tasks involved Exclusion criteria: prior stroke with resulting motor deficits; space-occupying haemorrhagic transformation or associated intracranial haemorrhage; recent Botox injection to upper limb or planned Botox injection over the course of the 7-month study duration; MoCA $\leq$ 20; history of physical or neurological condition that interferes with study procedures or assessment of motor function; contraindications to tDCS; inability to sit in a chair and perform upper limb exercises for one hour at a time; participation in another upper extremity rehab study or tDCS study during the study period; terminal illness; social or personal circumstances that interfere with the ability to return for therapy sessions and follow-up assessments
Interventions	3 arms 1. Active tDCS plus robot-assisted arm therapy with the ArmeoPower device (30 hours in total) 2. Sham tDCS plus robot-assisted arm therapy with the ArmeoPower device (30 hours in total) 3. Conventional occupational therapy that emphasises task-oriented training
Outcomes	Primary outcome measure 1. Change in UE-FM (from baseline to the end of intervention) Secondary outcome measure

NCT02292251 (*Continued*)

	1. Change in UE-FM (from baseline to 3 months follow-up)
Starting date	May 2015
Contact information	John Krakauer, MD Johns Hopkins University Baltimore, Maryland, United States, 21205
Notes	

NCT02308852

Trial name or title	Improving bi-manual activities in stroke patients with application of neurostimulation
Methods	Randomised cross-over trial
Participants	Estimated enrolment: 100 Inclusion criteria: age between 18 and 95 years; stroke with at least slight deficit Exclusion criteria: epilepsy; contraindications to tDCS and fMRI; presence of metal in the head; inability to understand/complete behavioural tasks; chronic substance abuse; major health condition; pacemaker; pregnancy
Interventions	2 arms 1. Active tDCS (20 minutes) during bimanual task training 2. Sham tDCS (20 minutes) during bimanual task training
Outcomes	Primary outcome measure 1. Bimanual co-ordination (at the end of intervention and at 1 week and up to 2, 3, 4 weeks after the intervention) Secondary outcome measures 1. Standard unimanual evaluation (i.e. PPT, hand dynamometer, pinch dynamometer, 9-HPT, motor skill learning with a video game; measured immediately, 30, 60 and up to 120 minutes after the intervention; follow-up tests at 1 week and up to 2, 3, 4 weeks after the intervention)
Starting date	October 2014
Contact information	Yves Vandermeeren, MD,PhD University Hospital CHU Dinant Godinne UcL Namur Yvoir, Belgium, 5530
Notes	

NCT02325427

Trial name or title	Changes in cortical excitability associated with upper limb motor recovery - a study of neural strategies employed in motor recovery
Methods	RCT with parallel-group design
Participants	Estimated enrolment: 119 Inclusion criteria: age 21 to 80 years; first-ever hemiplegic stroke < 2 weeks prior to study enrolment; UE-FM between 0 and 45; MMSE $\geq$ 24; ability to provide informed consent Exclusion criteria: pregnancy; cardiac pacemakers; metal implants; history of epilepsy; sensorimotor impairments due to other causes than stroke; uncontrolled medical conditions; diabetes mellitus and unstable angina; major depression and history of psychotic disorders
Interventions	3 arms 1. A-tDCS with the anode placed over the cortical representation of the hand of M1 of the affected hemisphere (1 mA for 20 minutes) 2. Sham tDCS with the anode placed over the cortical representation of the hand of M1 of the affected hemisphere (1 mA for 20 minutes) 3. No intervention
Outcomes	Primary outcome measure 1. Cortical excitability (up to 6 months poststroke) Secondary outcome measures 1. MAS (at 5 to 14 days, 4 to 6 weeks and 6 months poststroke) 2. Manual muscle testing (at 5 to 14 days, 4 to 6 weeks and 6 months poststroke) 3. BBT (at 5 to 14 days, 4 to 6 weeks and 6 months poststroke) 4. UE-FM (at 5 to 14 days, 4 to 6 weeks and 6 months poststroke)
Starting date	November 2014
Contact information	Effie Chew, MD National University Hospital Singapore, Singapore, 119074
Notes	

NCT02389608

Trial name or title	The immediate effect of electrical stimulation transcranial direct current (tDCS) associated with the use of FES, in muscle activity of the tibialis anterior muscle, balance and plantar pressure distribution of individuals with hemiparesis due to stroke - randomised, double blind
Methods	Randomised cross-over trial
Participants	Estimated enrolment: 30 Inclusion criteria: age above 20 years; hemiparesis due to stroke; ability to maintain a standing position without an assistance device for at least 60 seconds; signed informed consent Exclusion criteria: other health condition or use of medication affecting balance; positive cutoff point for cognitive deficit (MMSE); illiteracy; Wernicke's aphasia; reduced ankle mobility due to history of ankle fracture and use of pins in ankle; strength less than grade 1 in the tibialis anterior muscle; tDCS contraindication;

NCT02389608 (*Continued*)

	skin infection at the tDCS/FES site; anaesthesia/hyperaesthesia at FES site
Interventions	Each participant will undergo all of the following conditions 1. A-tDCS over M1 (2 mA for 20 minutes) + sham FES over the tibialis anterior muscle + active tibialis anterior muscle contraction 2. Sham tDCS over M1 + active FES over the tibialis anterior muscle + active tibialis anterior muscle contraction 3. A-tDCS over M1 (2 mA for 20 minutes) + active FES over the tibialis anterior muscle + active tibialis anterior muscle contraction 4. Sham tDCS over M1 + sham FES over the tibialis anterior muscle + active tibialis anterior muscle contraction
Outcomes	Outcomes will be recorded at baseline and at 1 year after the end of intervention period Primary outcome measure 1. EMG activity of tibialis anterior muscle
Starting date	January 2015
Contact information	Aline M.A Fruhauf University Nove de Julho São Paulo, SP, Brazil
Notes	

NCT02393651

Trial name or title	Late LTP-like plasticity effects of tDCS in subacute stroke patients
Methods	RCT with parallel-group design
Participants	Estimated enrolment: 48 Inclusion criteria: age 18 to 79 years; single ischaemic stroke, documented by a neurologist; subacute stroke within 1 to 3 weeks poststroke; acute hemiparesis with Fugl-Meyer Stage < IV Exclusion criteria: absence of MEPs; absence of voluntarily movement (Fugl-Meyer Stage < III); head injury or metal in the head; history of cranial irradiation; history of epilepsy; pacemaker; anticonvulsant or neuroleptic medication; substance abuse; inability to understand instructions history of psychiatric disorders
Interventions	2 arms 1. Dual-tDCS plus motor training of the affected upper extremity 2. Sham tDCS plus motor training of the affected upper extremity
Outcomes	Primary outcome measure 1. Change in UE-FM (at 1 week, 2 weeks; 4 weeks and 12 weeks) Secondary outcome measures 1. ARAT (at 1 week, 2 weeks; 4 weeks and 12 weeks) 2. Hand grip strength (at 1 week, 2 weeks; 4 weeks and 12 weeks) 3. 10MWT (at 1 week, 2 weeks; 4 weeks and 12 weeks) 4. EuroQoL-5D (at 12 weeks)

NCT02393651 (*Continued*)

	5. BI (at 1 week, 2 weeks; 4 weeks and 12 weeks) 6. HADS (at 4 and 12 weeks) 7. MoCA (at 4 and 12 weeks) 8. Wong-Baker FACES Pain Rating Scale (every stimulation session)
Starting date	March 2015
Contact information	Rick van der Vliet, MSc Rijndam Rotterdam, Zuid-Holland, Netherlands, 3015LJ
Notes	

NCT02399540

Trial name or title	Late LTP-like plasticity effects of tDCS in chronic stroke patients
Methods	RCT with parallel-group design
Participants	Estimated enrolment: 80 Inclusion criteria: aged 18 to 79 years; stroke onset > 6 months prior to enrolment; motor deficit in the upper limb due to the stroke Exclusion criteria: absence of MEPs; absence of voluntarily movement (Fugl-Meyer Stage < III); head injury or metal in the head; history of cranial irradiation; history of epilepsy; pacemaker; anticonvulsant or neuroleptic medication; substance abuse; inability to understand instructions; history of psychiatric disorders
Interventions	4 arms 1. Day 1: sham tDCS; Day 2: sham tDCS 2. Day 1: sham tDCS; Day 2: conventional paired tDCS 3. Day 1: conventional unpaired tDCS; Day 2: sham tDCS 4. Day 1: late LTP-like plasticity tDCS; Day 2: sham tDCS
Outcomes	Primary outcome measures 1. Motor skill retention (at day 9) Secondary outcome measures 1. Maximum grip force (at day 1 and at day 9) 2. PPT (at day 1 and at day 9)
Starting date	March 2015
Contact information	Contact: Rick van der Vliet, MSc Rijndam Rotterdam, Zuid-Holland, Netherlands, 3015LJ
Notes	

NCT02401724

Trial name or title	A randomised trial of non-invasive brain stimulation (NIBS) in stroke survivors
Methods	RCT with parallel-group design
Participants	Estimated enrolment: 60 Inclusion criteria: aged between 18 and 90 years; ischaemic stroke affecting right hemisphere, radiologically confirmed; persistent neglect > 1 months after stroke, confirmed by BIT; prestroke functional independence (mRS 0 to 2) Exclusion criteria: patients who do not understand English; bilateral infarcts, radiologically confirmed; MoCA < 26; other neurological diseases; significant morbidity; alcohol excess; exclusion criteria for tDCS
Interventions	4 arms 1. Training exercises (lifting rods) 2. Active tDCS over the left/undamaged hemisphere (1 mA for 15 minutes) for 10 sessions in 3 weeks 3. Training exercises (lifting rods) plus active tDCS over the left/undamaged hemisphere (1 mA for 15 minutes) for 10 sessions in 3 weeks 4. Control training (reaching rods with the unaffected hand)
Outcomes	Primary outcome measure 1. Change in BIT (at 6 months after the end of intervention) Secondary outcome measures: 1. Compliance as measured by adherence to task instructions (at baseline, at 3 weeks and at 6 months) 2. Retention numbers (at baseline, at 3 weeks and at 6 months)
Starting date	March 2015
Contact information	Monika Harvey, BSc (Hons), MSc, PhD NHS Greater Glasgow and Clyde
Notes	

NCT02416791

Trial name or title	Robotic therapy and transcranial direct current stimulation in patients with stroke
Methods	RCT with parallel-group design
Participants	Estimated enrolment: 51 Inclusion criteria: stroke onset 3 to 9 weeks prior to enrolment, radiologically confirmed; UE-FM between 7 and 38; ability to provide informed consent; ability to comply with the schedule of interventions and evaluation of the protocol Exclusion criteria: MAS > 3 in the paretic arm; upper limb plegia; uncontrolled medical conditions; pregnancy; seizures; pacemakers; other neurological disorders; psychiatric illnesses; aphasia compromising comprehension of the experimental protocol; MMSE < 23 for patients with > 1 year of education and MMSE < 19 for patients with > 1 year of education; hemineglect
Interventions	2 arms 1. C-tDCS over M1 of the affected hemisphere (1 mA for 20 minutes) prior to robotic training with the

NCT02416791 (*Continued*)

	MIT-Manus, followed by physical therapy for 40 minutes 3 times a week for 6 weeks 2. Sham tDCS over M1 of the affected hemisphere prior to robotic training with the MIT-Manus, followed by physical therapy for 40 minutes 3 times a week for 6 weeks 3. Sham tDCS over M1 of the affected hemisphere prior to physical therapy for 40 minutes, followed by occupational therapy for 40 minutes 3 times a week for 6 weeks
Outcomes	Primary outcome measures 1. Change in UE-FM (at 6 weeks) 2. Adverse events (at 6 weeks) Secondary outcome measures 1. mRS (change from baseline to 6 weeks) 2. NIHSS (change from baseline to 6 weeks) 3. SIS (change from baseline to 6 weeks) 4. MAS (change from baseline to 6 weeks) 5. MAL (change from baseline to 6 weeks) 6. UE-FM (at 6 months) 7. Adverse events (at 6 months) 8. FSS (change from baseline to 6 weeks) 9. Pittsburgh Sleep Quality Index (change from baseline to 6 weeks)
Starting date	June 2015
Contact information	Thais Midori K Tokuno Hospital das Clínicas São Paulo, SP, Brazil, 05403900
Notes	

NCT02422173

Trial name or title	Effects of different montages of transcranial direct current stimulation on the risk of falls and lower limb function for acute stroke patients: a randomised controlled trial
Methods	RCT with parallel-group design
Participants	Estimated enrolment: 60 Inclusion criteria: clinical diagnosis of acute stroke; ability to walk 10 metres independently; high risk of falling Exclusion criteria: severe functional limitations; cognitive impairment
Interventions	4 arms 1. A-tDCS over the affected hemisphere (2 mA) on 5 consecutive days for 2 weeks 2. C-tDCS over the unaffected hemisphere (2 mA) 3. Dual-tDCS with the anode positioned over the affected hemisphere and the cathode over the unaffected hemisphere (2 mA) 4. Sham tDCS (2 mA for 30 seconds)

NCT02422173 (*Continued*)

Outcomes	Primary outcome measure 1. Four Square Step Test (change from baseline at 3 months) Secondary outcome measures 1. Occurrence of Falling Index (at week 2, week 4 and week 12) 2. Overall Stability Index (at week 2, week 4 and week 12) 3. Falls Efficacy Scale (at week 2, week 4 and week 12) 4. BBS (at week 2, week 4 and week 12) 5. 6MWT (at week 2, week 4 and week 12) 6. STST (at week 2, week 4 and week 12)
Starting date	January 2015
Contact information	Suellen Marinho Andrade Federal University of Paraíba
Notes	

NCT02455427

Trial name or title	Safety of transcranial direct current stimulation in the subacute phase after stroke
Methods	RCT with parallel-group design
Participants	Estimated enrolment: 40 Inclusion criteria: age between 18 and 80 years; ischaemic stroke, radiologically confirmed; onset between 72 hours and 6 weeks prior to enrolment; unilateral paresis of upper limb; NIHSS between 5 and 15; NIHSS score of at least 1 point in items 5a or 5b; written informed consent Exclusion criteria: lesions affecting the corticomotor pathway in the hemisphere contralateral to the stroke; use of neuroleptics or other psychoactive drugs; except antidepressants; advanced systemic diseases; other neurologic diseases except migraine; mRS < 2 prior to stroke; advanced systemic diseases; uncontrolled medical conditions; contraindications for physical therapy; pregnancy; absolute or relative contraindications for tDCS
Interventions	2 arms 1. A-tDCS over M1 of the affected hemisphere (for 20 minutes) followed by 60 minutes of physical therapy 3 times a week for 2 weeks 2. Sham tDCS (for 20 minutes) followed by 60 minutes of physical therapy 3 times a week for 2 weeks
Outcomes	Primary outcome measures 1. Frequency of adverse events at 2 weeks Secondary outcome measures 1. Change in mRS at 2 and 14 weeks 2. Change in NIHSS at 2 and 14 weeks 3. Change in SIS at 2 and 14 weeks 4. Change in UE-FM at 2 and 14 weeks 5. Change in MAS at 2 and 14 weeks 6. Change in MAL at 2 and 14 weeks 7. MoCA at 2 and 14 weeks 8. Structural connectivity (measured by DTI) at 2 weeks

NCT02455427 (*Continued*)

	9. Functional connectivity (measured by resting-state fMRI) at 2 weeks 10. Change in BI at 2 and 14 weeks 11. Frequency of adverse events at 14 weeks
Starting date	May 2015
Contact information	Adriana B Conforto, MD Phd Hospital Israelita Albert Einstein Brazil
Notes	

NTR3315

Trial name or title	The effect of noninvasive brain stimulation on lower limb motor skill acquisition
Methods	Randomised controlled double-blind trial with parallel assignment
Participants	60 participants 18 years of age or older with hemiparesis due to a first-time ever ischaemic subcortical stroke at least 6 months before study enrolment, good vision on 2 metre distance, being able to stand and to make stepping movements for 42 minutes, independent walkers with clear walking impairment Exclusion criteria: metallic implants in the brain, presence of severe or frequent headache, other neurological disorders or orthopaedic problems, history of cardiac conditions that interfere with physical load
Interventions	3 training sessions with 3 different interventions of tDCS during the first 10 minutes of each training session 1. Experimental 1: A-tDCS of M1 2. Experimental 2: A-tDCS of cerebellum 3. Sham comparator: Sham tDCS
Outcomes	Primary outcome measure 1. Relative change in motor skill between the first and last training blocks (total learning) Secondary outcome measure 1. Change in motor skill during motor skill training (online learning) 2. Change in motor skill between 2 consecutive motor skill training sessions (offline learning)
Starting date	1 March 2012
Contact information	Edwin van Asseldonk, e.h.f.vanasseldonk@utwente.nl
Notes	

Paquette 2013

Trial name or title	Not stated by the authors
Methods	Not clearly stated by the authors
Participants	Estimated enrolment: not stated by the authors Inclusion criteria: not stated by the authors Exclusion criteria: not stated by the authors
Interventions	4 arms 1. active "inhibitory stimulation" of rTMS over the unaffected M1 (for 15 minutes) followed by active C-tDCS over unaffected M1 during a physiotherapy session (for 40 to 60 minutes) for up to 10 days 2. sham "inhibitory stimulation" of rTMS over the unaffected M1 (for 15 minutes) followed by active C-tDCS over unaffected M1 during a physiotherapy session (for 40 to 60 minutes) for up to 10 days 3. active "inhibitory stimulation" of rTMS over the unaffected M1 (for 15 minutes) followed by sham C-tDCS over unaffected M1 during a physiotherapy session (for 40 to 60 minutes) for up to 10 days 4. sham "inhibitory stimulation" of rTMS over the unaffected M1 (for 15 minutes) followed by sham C-tDCS over unaffected M1 during a physiotherapy session (for 40 to 60 minutes) for up to 10 days
Outcomes	CAHAI
Starting date	Not stated by the authors
Contact information	None known
Notes	Conference abstract only

Sattler 2012

Trial name or title	Not stated by the authors
Methods	Study design: randomised double-blind sham-controlled trial (parallel-group design)
Participants	Estimated enrolment: 20 patients within the first month of a cortical or subcortical stroke
Interventions	2 arms 1. A-tDCS + rEPNS of the radial nerve of the paretic side at 5 consecutive daily sessions 2. Sham tDCS + rEPNS of the radial nerve of the paretic side at 5 consecutive daily sessions
Outcomes	Motor performance as measured by JTT at baseline, after the intervention period and at 5, 15 and 30 days of follow-up Cortical excitability at baseline
Starting date	Not stated by the authors
Contact information	None known
Notes	Conference abstract only

6MWT: Six minute walking test
9-HPT: Nine-Hole Peg Test
10MWT: 10-Meter Walk Test
A-tDCS: anodal transcranial direct current stimulation
AAP: Adelaide Activities Profile
AMES: Assisted Motion with Enhanced Sensation device
ARAT: Action Research Arm Test
BBS: Berg Balance Scale
BBT: Box and Block Test
BDI: Beck Depression Inventory
BI: Barthel Index
BIT: Behavioural Inattention Test
BTN: Negligence Battery Test
C-tDCS: cathodal transcranial direct current stimulation
CIMT: constraint-induced movement therapy
CMSA: Chedoke-McMaster Stroke Assessment
CNS: central nervous system
COP: centre of pressure
DTI: Diffusion Tensor Imaging
EEG: electroencephalography
EMG: electromyography
FBCSP: Filter Bank Common Spatial Pattern
FIM: Functional Independence Measure
FMA: Fugl-Meyer Assessment
fMRI: functional magnetic resonance imaging
FSS: Fatigue Severity Scale
GABA: gamma-aminobutyric acid
ITT: intention-to-treat
JTT: Jebsen Taylor Hand Function Test
M1: primary motor cortex
mA: milliampere
MEP: motor-evoked potentials
MAL: Motor Activity Log
MAS: Motor Assessment Scale
MCA: middle cerebral artery
mCIMT: modified constraint-induced movement therapy
MI-BCI: motor imagery brain-computer interface
MoCA: Montreal Cognitive Assessment
MMSE: Mini Mental State Examination
MRC: Medical Research Council
MRI: magnetic resonance imaging
NIHSS: National Institutes of Health Stroke Scale
NMDA: *N*-methyl-D-aspartate
OT: occupational therapy
PPT: Purdue Pegboard Test
RCT: randomised controlled trial
ROM: range of motion
RMAB: Rivermead Motor Assessment Battery
rEPNS: repetitive peripheral nerve stimulation
rNSA: revised Nottingham Sensory Assessment

rTMS:
SAH: subarachnoidal haemorrhage

SIS: Stroke Impact Scale
SS-QOL: Stroke Specific Quality of Life
STST: Sit to Stand Test
TBI: traumatic brain injury
TCT: Trunk Control Test
tDCS: transcranial direct current stimulation
TMS: transcranial magnetic stimulation
TUG: Timed Up and Go Test
UBS: Unified Balance Scale
UE-FM: Upper Extremity Fugl-Meyer
VAS: Visual Analogue Scale
WMFT: Wolf Motor Function Test

DATA AND ANALYSES

Comparison 1. tDCS versus any type of placebo or passive control intervention

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Primary outcome measure: ADLs at the end of the intervention period	10		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
1.1 Absolute values	9	396	Std. Mean Difference (IV, Random, 95% CI)	0.24 [0.03, 0.44]
1.2 Change scores	1	11	Std. Mean Difference (IV, Random, 95% CI)	0.46 [-0.75, 1.67]
2 Primary outcome measure: ADLs until the end of follow-up	6	269	Std. Mean Difference (IV, Random, 95% CI)	0.31 [0.01, 0.62]
3 Secondary outcome measure: upper extremity function at the end of the intervention period	16		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
3.1 Absolute values	12	431	Std. Mean Difference (IV, Random, 95% CI)	0.11 [-0.17, 0.39]
3.2 Change scores	4	53	Std. Mean Difference (IV, Random, 95% CI)	0.32 [-0.51, 1.15]
4 Secondary outcome measure: upper extremity function to the end of follow-up	5		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
4.1 Absolute values	4	187	Std. Mean Difference (IV, Random, 95% CI)	0.01 [-0.48, 0.50]
4.2 Change scores	1	18	Std. Mean Difference (IV, Random, 95% CI)	1.49 [0.40, 2.59]
5 Secondary outcome measure: lower extremity function at the end of the intervention period	4		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
5.1 Absolute values	2	50	Std. Mean Difference (IV, Random, 95% CI)	0.20 [-1.26, 1.67]
5.2 Change scores	2	25	Std. Mean Difference (IV, Random, 95% CI)	0.81 [-0.02, 1.65]
6 Secondary outcome measure: muscle strength at the end of the intervention period	10		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
6.1 Absolute values	8	272	Std. Mean Difference (IV, Random, 95% CI)	0.14 [-0.11, 0.38]
6.2 Change values	2	41	Std. Mean Difference (IV, Random, 95% CI)	0.05 [-2.12, 2.23]
7 Secondary outcome measure: muscle strength at the end of follow-up	3	156	Std. Mean Difference (IV, Random, 95% CI)	0.07 [-0.26, 0.41]
8 Secondary outcome measure: cognitive abilities at the end of the intervention period	1		Mean Difference (IV, Random, 95% CI)	Totals not selected
9 Secondary outcome measure: dropouts, adverse events and deaths during the intervention period	23	664	Risk Difference (M-H, Random, 95% CI)	0.01 [-0.02, 0.03]

Comparison 2. tDCS versus any type of active control intervention

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Primary outcome measure: ADLs at the end of the intervention period, absolute values	1		Mean Difference (IV, Random, 95% CI)	Totals not selected
2 Secondary outcome measure: upper extremity function at the end of the intervention period	1		Mean Difference (IV, Random, 95% CI)	Totals not selected
3 Secondary outcome measure: lower extremity function at the end of the intervention period	1		Mean Difference (IV, Random, 95% CI)	Totals not selected
4 Secondary outcome measure: dropouts, adverse events and deaths during the intervention period	2	70	Risk Difference (M-H, Random, 95% CI)	0.0 [-0.07, 0.07]

Comparison 3. Subgroup analyses for primary outcome measure: ADLs at the end of the intervention period

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Planned analysis: duration of illness - acute/subacute phase versus postacute phase for ADLs at the end of the intervention period	10		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
1.1 Acute/subacute phase (the first week after stroke and the second to the fourth week after stroke	4	213	Std. Mean Difference (IV, Random, 95% CI)	0.22 [-0.07, 0.51]
1.2 Postacute phase (from the first to the sixth month after stroke)	2	140	Std. Mean Difference (IV, Random, 95% CI)	0.30 [-0.22, 0.82]
1.3 Chronic phase (from the sixth month after stroke)	4	93	Std. Mean Difference (IV, Random, 95% CI)	-0.01 [-0.41, 0.40]
2 Planned analysis: effects of type of stimulation (A-tDCS/C-tDCS/dual-tDCS) and location of stimulation (lesioned/non-lesioned hemisphere) on ADLs at the end of the intervention period (study groups collapsed)	10		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only

2.1 A-tDCS over the lesioned hemisphere	5	164	Std. Mean Difference (IV, Random, 95% CI)	-0.04 [-0.35, 0.27]
2.2 C-tDCS over the lesioned hemisphere	6	301	Std. Mean Difference (IV, Random, 95% CI)	0.33 [0.10, 0.57]
2.3 Dual-tDCS (A-tDCS over the lesioned and C-tDCS over the non-lesioned hemisphere)	2	33	Std. Mean Difference (IV, Random, 95% CI)	0.30 [-0.39, 0.99]
3 Planned analysis: type of control intervention (sham tDCS, conventional therapy or nothing)	10		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
3.1 Sham tDCS	8	337	Std. Mean Difference (IV, Random, 95% CI)	0.23 [0.01, 0.46]
3.2 Active control intervention	2	109	Std. Mean Difference (IV, Random, 95% CI)	0.14 [-0.24, 0.53]

Analysis 1.1. Comparison 1 tDCS versus any type of placebo or passive control intervention, Outcome 1 Primary outcome measure: ADLs at the end of the intervention period.

Review: Transcranial direct current stimulation (tDCS) for improving activities of daily living, and physical and cognitive functioning, in people after stroke

Comparison: 1 tDCS versus any type of placebo or passive control intervention

Outcome: 1 Primary outcome measure: ADLs at the end of the intervention period

Study or subgroup	Favours sham tDCS N	Mean(SD)	Sham tDCS N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
1 Absolute values							
Bolognini 2011	7	2.3 (3.6)	7	2.5 (2.6)		3.8 %	-0.06 [-1.11, 0.99]
Di Lazzaro 2014a	7	-3 (1)	7	-3 (1.3)		3.8 %	0.0 [-1.05, 1.05]
Di Lazzaro 2014b	10	-2.4 (1.17)	9	-3.1 (1.38)		5.0 %	0.53 [-0.39, 1.45]
Hesse 2011	64	56.4 (13.5)	32	56.3 (15.5)		23.3 %	0.01 [-0.42, 0.43]
Khedr 2013	27	52 (24.5)	13	41 (18)		9.3 %	0.48 [-0.19, 1.15]
Kim 2010	11	86.1 (14.4)	7	71 (34.4)		4.4 %	0.60 [-0.37, 1.57]
Lee 2014	39	69.9 (16.6)	20	64.3 (24.5)		14.3 %	0.28 [-0.26, 0.82]
Tedesco Triccas 2015b	22	1.2 (2.1)	24	1.6 (1.8)		12.5 %	-0.20 [-0.78, 0.38]
Wu 2013a	45	76.2 (19.6)	45	65.4 (20.4)		23.7 %	0.54 [0.11, 0.96]
Subtotal (95% CI)	**232**		**164**			**100.0 %**	**0.24 [0.03, 0.44]**
Heterogeneity: Tau^2 = 0.0; Chi^2 = 7.19, df = 8 (P = 0.52); I^2 =0.0%							
Test for overall effect: Z = 2.28 (P = 0.023)							
2 Change scores							
Fusco 2014	5	26 (21)	6	18 (10)		100.0 %	0.46 [-0.75, 1.67]

-2 -1 0 1 2

Favours sham tDCS Favours active tDCS

(*Continued* . . .)

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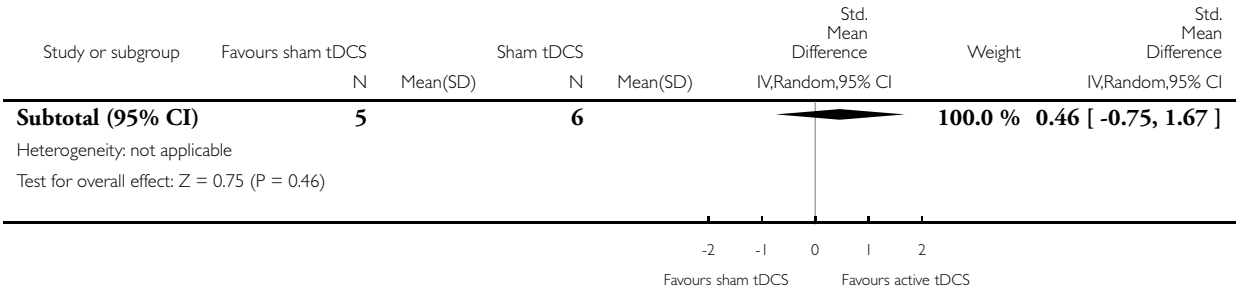
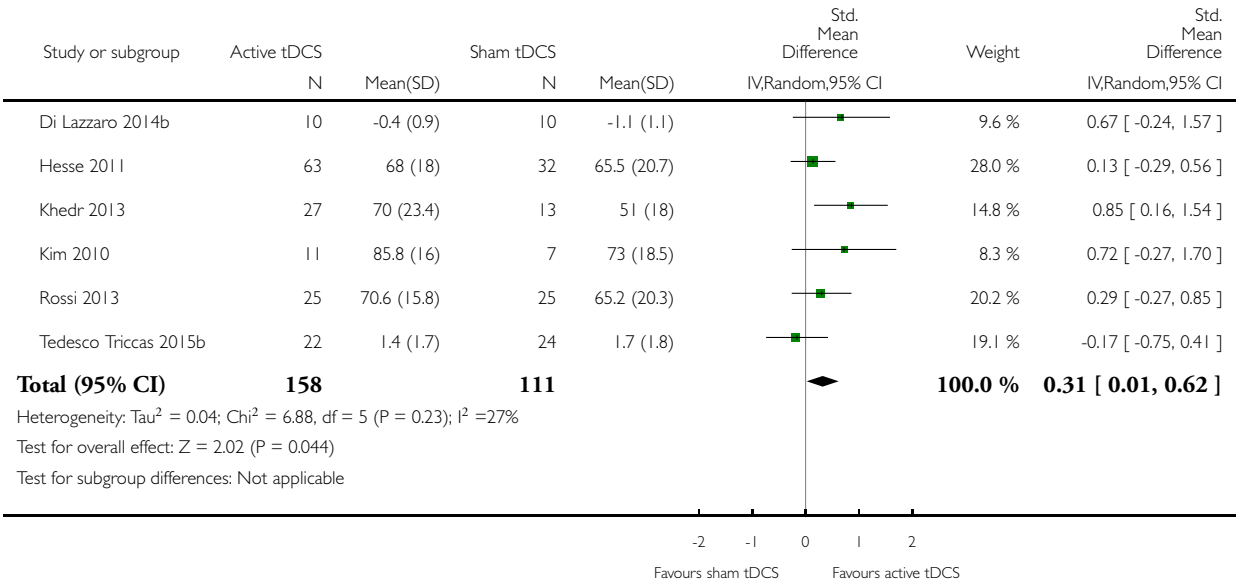


Analysis 1.2. Comparison 1 tDCS versus any type of placebo or passive control intervention, Outcome 2 Primary outcome measure: ADLs until the end of follow-up.

Review: Transcranial direct current stimulation (tDCS) for improving activities of daily living, and physical and cognitive functioning, in people after stroke

Comparison: 1 tDCS versus any type of placebo or passive control intervention

Outcome: 2 Primary outcome measure: ADLs until the end of follow-up

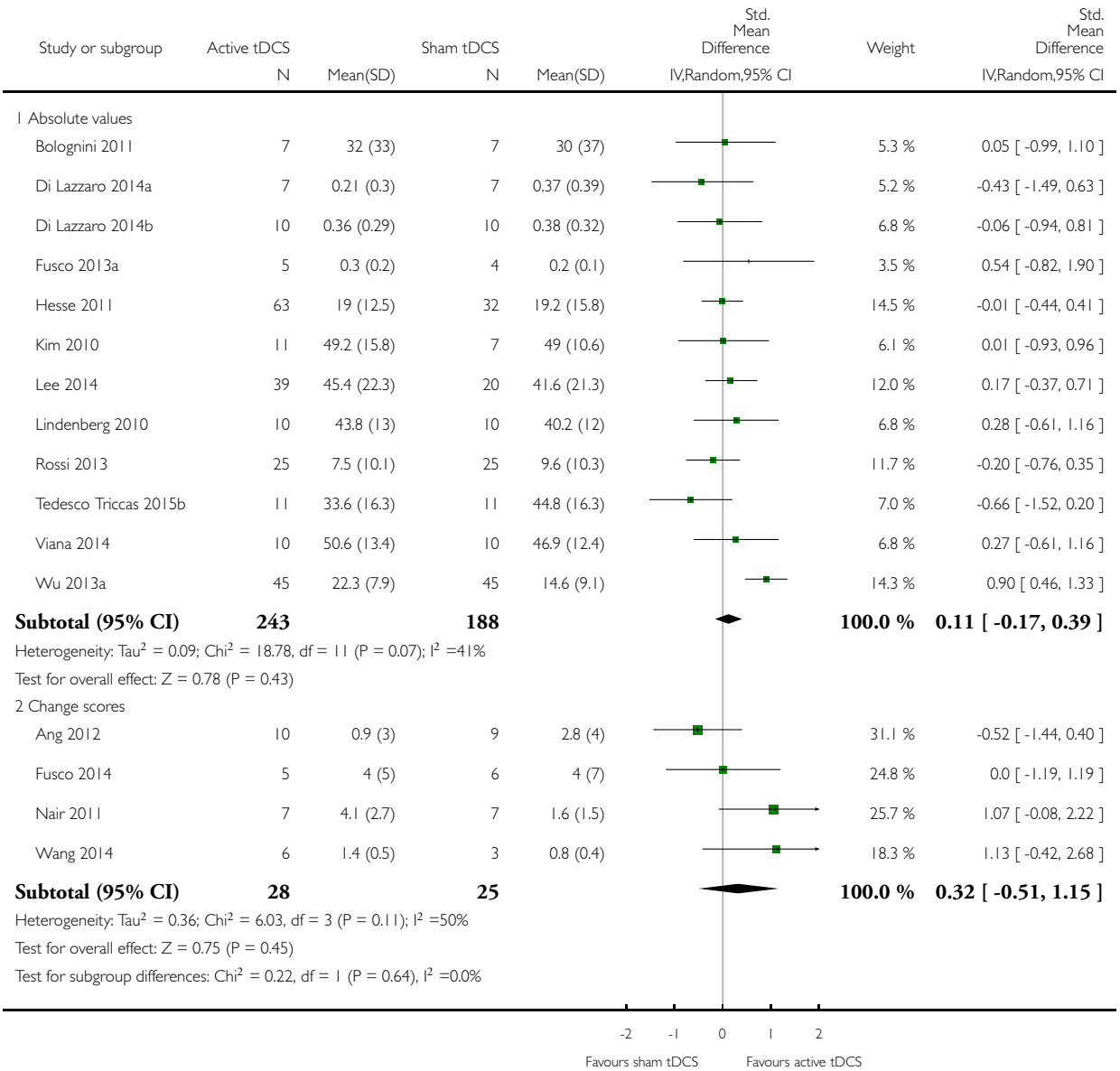


Analysis 1.3. Comparison 1 tDCS versus any type of placebo or passive control intervention, Outcome 3 Secondary outcome measure: upper extremity function at the end of the intervention period.

Review: Transcranial direct current stimulation (tDCS) for improving activities of daily living, and physical and cognitive functioning, in people after stroke

Comparison: 1 tDCS versus any type of placebo or passive control intervention

Outcome: 3 Secondary outcome measure: upper extremity function at the end of the intervention period

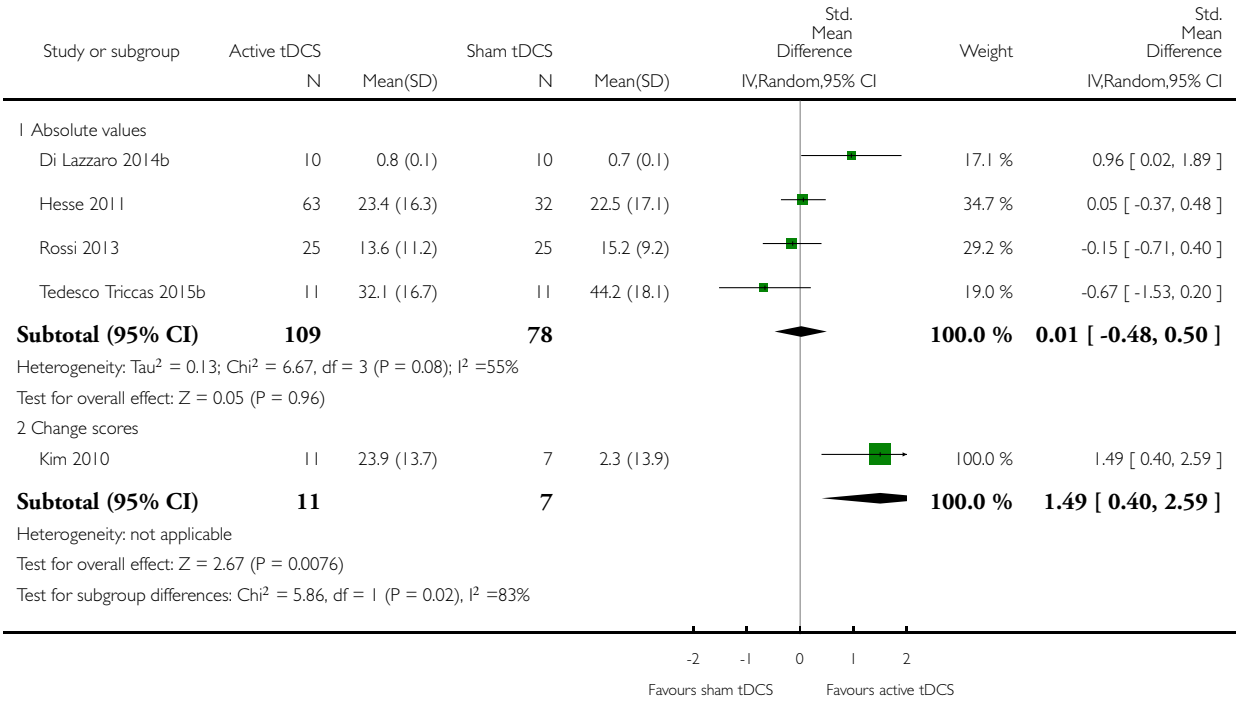


Analysis 1.4. Comparison 1 tDCS versus any type of placebo or passive control intervention, Outcome 4 Secondary outcome measure: upper extremity function to the end of follow-up.

Review: Transcranial direct current stimulation (tDCS) for improving activities of daily living, and physical and cognitive functioning, in people after stroke

Comparison: 1 tDCS versus any type of placebo or passive control intervention

Outcome: 4 Secondary outcome measure: upper extremity function to the end of follow-up

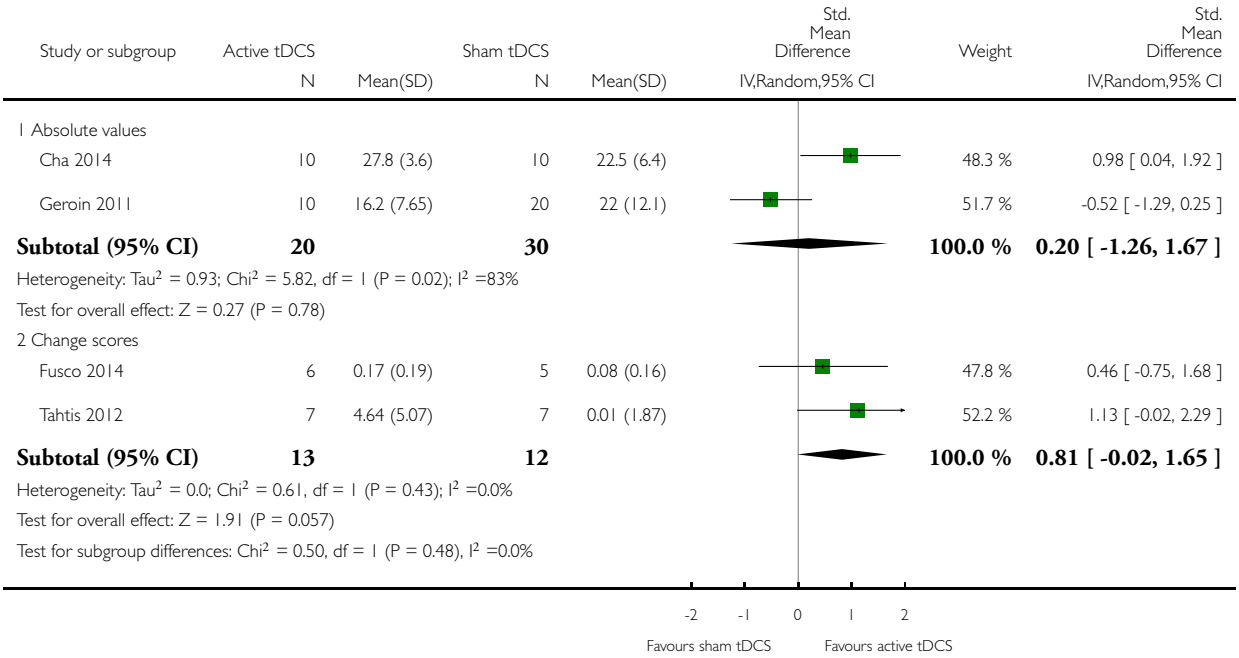


Analysis 1.5. Comparison 1 tDCS versus any type of placebo or passive control intervention, Outcome 5 Secondary outcome measure: lower extremity function at the end of the intervention period.

Review: Transcranial direct current stimulation (tDCS) for improving activities of daily living, and physical and cognitive functioning, in people after stroke

Comparison: 1 tDCS versus any type of placebo or passive control intervention

Outcome: 5 Secondary outcome measure: lower extremity function at the end of the intervention period

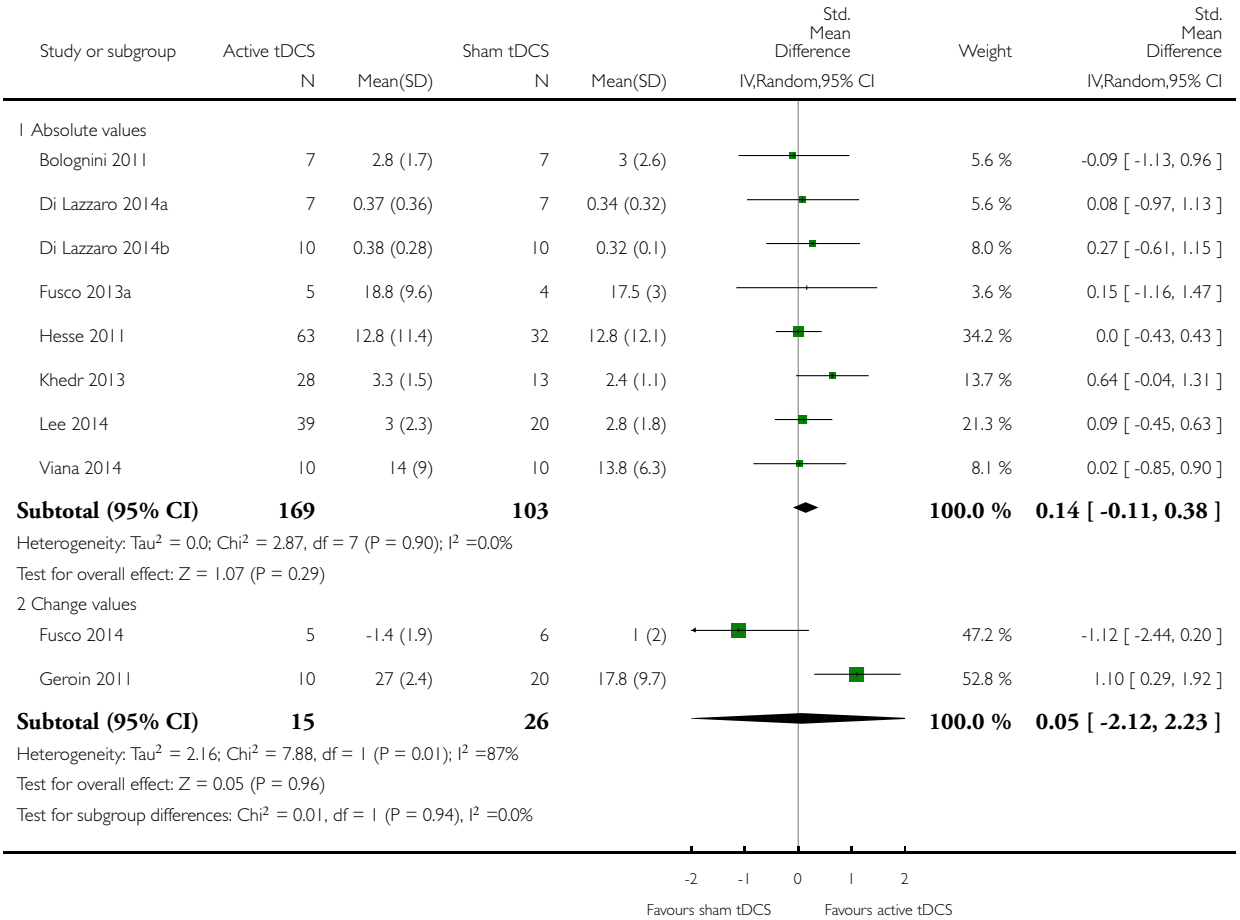


Analysis 1.6. Comparison 1 tDCS versus any type of placebo or passive control intervention, Outcome 6 Secondary outcome measure: muscle strength at the end of the intervention period.

Review: Transcranial direct current stimulation (tDCS) for improving activities of daily living, and physical and cognitive functioning, in people after stroke

Comparison: 1 tDCS versus any type of placebo or passive control intervention

Outcome: 6 Secondary outcome measure: muscle strength at the end of the intervention period

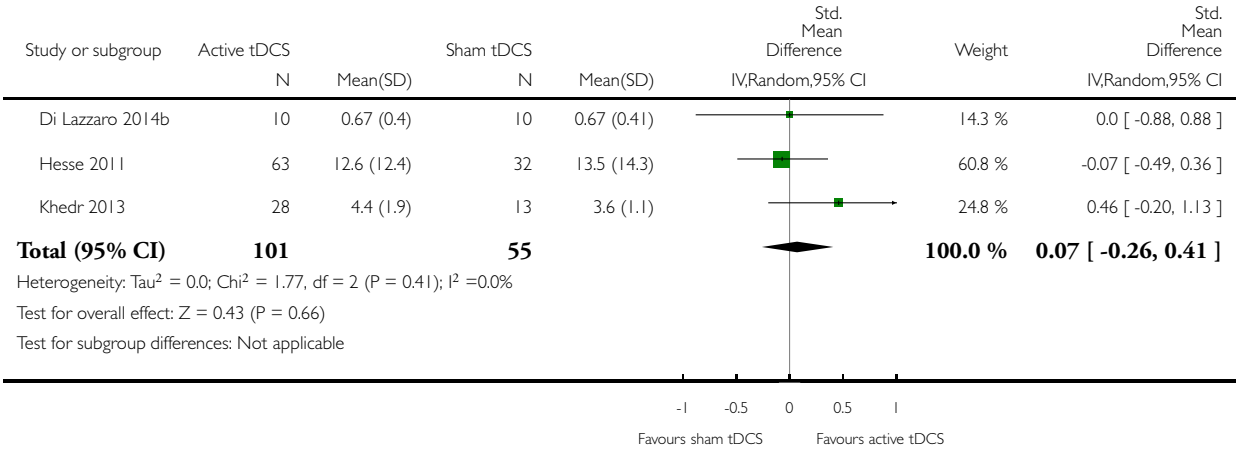


Analysis 1.7. Comparison 1 tDCS versus any type of placebo or passive control intervention, Outcome 7 Secondary outcome measure: muscle strength at the end of follow-up.

Review: Transcranial direct current stimulation (tDCS) for improving activities of daily living, and physical and cognitive functioning, in people after stroke

Comparison: 1 tDCS versus any type of placebo or passive control intervention

Outcome: 7 Secondary outcome measure: muscle strength at the end of follow-up

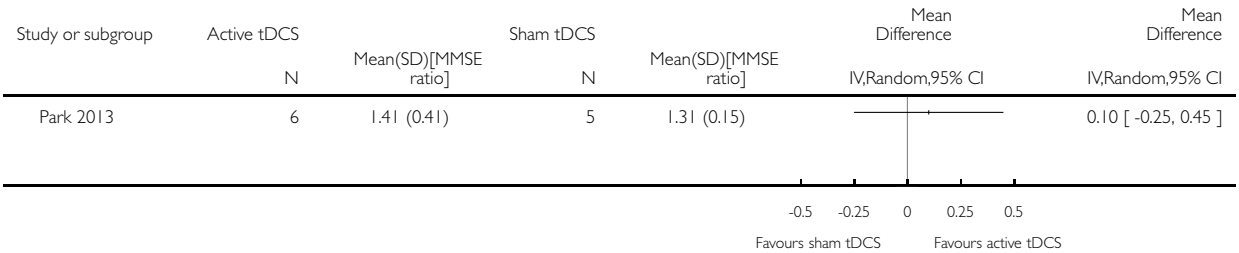


Analysis 1.8. Comparison 1 tDCS versus any type of placebo or passive control intervention, Outcome 8 Secondary outcome measure: cognitive abilities at the end of the intervention period.

Review: Transcranial direct current stimulation (tDCS) for improving activities of daily living, and physical and cognitive functioning, in people after stroke

Comparison: 1 tDCS versus any type of placebo or passive control intervention

Outcome: 8 Secondary outcome measure: cognitive abilities at the end of the intervention period



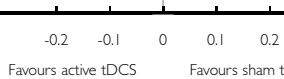
Analysis 1.9. Comparison 1 tDCS versus any type of placebo or passive control intervention, Outcome 9 Secondary outcome measure: dropouts, adverse events and deaths during the intervention period.

Review: Transcranial direct current stimulation (tDCS) for improving activities of daily living, and physical and cognitive functioning, in people after stroke

Comparison: 1 tDCS versus any type of placebo or passive control intervention

Outcome: 9 Secondary outcome measure: dropouts, adverse events and deaths during the intervention period

Study or subgroup	Active tDCS n/N	Sham tDCS n/N	Risk Difference M-H,Random,95% CI	Weight	Risk Difference M-H,Random,95% CI
Ang 2012	0/10	0/9		1.7 %	0.0 [-0.18, 0.18]
Boggio 2007a	0/3	0/3		0.3 %	0.0 [-0.46, 0.46]
Bolognini 2011	3/10	4/11		0.4 %	-0.06 [-0.47, 0.34]
Cha 2014	0/10	0/10		1.9 %	0.0 [-0.17, 0.17]
Di Lazzaro 2014a	0/7	0/7		1.0 %	0.0 [-0.24, 0.24]
Di Lazzaro 2014b	0/10	0/10		1.9 %	0.0 [-0.17, 0.17]
Fusco 2013a	0/5	0/4		0.5 %	0.0 [-0.34, 0.34]
Fusco 2014	2/7	1/7		0.3 %	0.14 [-0.28, 0.57]
Geroin 2011	0/10	0/10		1.9 %	0.0 [-0.17, 0.17]
Hesse 2011	1/64	0/32		19.0 %	0.02 [-0.04, 0.07]
Khedr 2013	0/27	0/13		4.9 %	0.0 [-0.11, 0.11]
Kim 2010	2/13	0/7		0.9 %	0.15 [-0.11, 0.42]
Lee 2014	3/42	1/22		4.3 %	0.03 [-0.09, 0.14]
Lindenberg 2010	0/10	0/10		1.9 %	0.0 [-0.17, 0.17]
Nair 2011	0/7	0/7		1.0 %	0.0 [-0.24, 0.24]
Park 2013	0/6	0/5		0.7 %	0.0 [-0.29, 0.29]
Qu 2009	0/25	0/25		10.4 %	0.0 [-0.07, 0.07]
Rossi 2013	0/25	0/25		10.4 %	0.0 [-0.07, 0.07]
Tahtis 2012	0/7	0/7		1.0 %	0.0 [-0.24, 0.24]
Tedesco Triccas 2015b	6/12	0/11		0.7 %	0.50 [0.21, 0.79]
Viana 2014	0/10	0/10		1.9 %	0.0 [-0.17, 0.17]
Wang 2014	0/6	0/3		0.4 %	0.0 [-0.38, 0.38]
Wu 2013a	0/45	0/45		32.4 %	0.0 [-0.04, 0.04]
Total (95% CI)	**371**	**293**		**100.0 %**	**0.01 [-0.02, 0.03]**



(*Continued* . . .)

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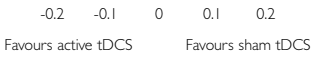
Study or subgroup	Active tDCS n/N	Sham tDCS n/N	Risk Difference M-H,Random,95% CI	Weight	Risk Difference M-H,Random,95% CI
Total events: 17 (Active tDCS), 6 (Sham tDCS)					
Heterogeneity: Tau^2 = 0.0; Chi^2 = 15.25, df = 22 (P = 0.85); I^2 =0.0%					
Test for overall effect: Z = 0.73 (P = 0.47)					
Test for subgroup differences: Not applicable					



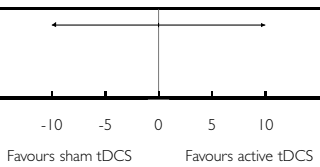
Analysis 2.1. Comparison 2 tDCS versus any type of active control intervention, Outcome 1 Primary outcome measure: ADLs at the end of the intervention period, absolute values.

Review: Transcranial direct current stimulation (tDCS) for improving activities of daily living, and physical and cognitive functioning, in people after stroke

Comparison: 2 tDCS versus any type of active control intervention

Outcome: 1 Primary outcome measure: ADLs at the end of the intervention period, absolute values

Study or subgroup	Active tDCS N	Mean(SD)[Bl points]	Sham tDCS N	Mean(SD)[Bl points]	Mean Difference IV,Random,95% CI	Mean Difference IV,Random,95% CI
Qu 2009	25	74 (16)	25	74 (20)		0.0 [-10.04, 10.04]



Analysis 2.2. Comparison 2 tDCS versus any type of active control intervention, Outcome 2 Secondary outcome measure: upper extremity function at the end of the intervention period.

Review: Transcranial direct current stimulation (tDCS) for improving activities of daily living, and physical and cognitive functioning, in people after stroke

Comparison: 2 tDCS versus any type of active control intervention

Outcome: 2 Secondary outcome measure: upper extremity function at the end of the intervention period

Study or subgroup	Active tDCS		Sham tDCS		Mean Difference	Mean Difference
	N	Mean(SD)[UE-FM]	N	Mean(SD)[UE-FM]	IV,Random,95% CI	IV,Random,95% CI
Cha 2014	10	48.7 (12.5)	10	29.7 (9.2)		19.00 [9.38, 28.62]

Analysis 2.3. Comparison 2 tDCS versus any type of active control intervention, Outcome 3 Secondary outcome measure: lower extremity function at the end of the intervention period.

Review: Transcranial direct current stimulation (tDCS) for improving activities of daily living, and physical and cognitive functioning, in people after stroke

Comparison: 2 tDCS versus any type of active control intervention

Outcome: 3 Secondary outcome measure: lower extremity function at the end of the intervention period

Study or subgroup	Active tDCS		Sham tDCS		Mean Difference	Mean Difference
	N	Mean(SD)[LE-FM]	N	Mean(SD)[LE-FM]	IV,Random,95% CI	IV,Random,95% CI
Cha 2014	10	27.8 (3.6)	10	22.5 (6.4)		5.30 [0.75, 9.85]

Analysis 2.4. Comparison 2 tDCS versus any type of active control intervention, Outcome 4 Secondary outcome measure: dropouts, adverse events and deaths during the intervention period.

Review: Transcranial direct current stimulation (tDCS) for improving activities of daily living, and physical and cognitive functioning, in people after stroke

Comparison: 2 tDCS versus any type of active control intervention

Outcome: 4 Secondary outcome measure: dropouts, adverse events and deaths during the intervention period

Study or subgroup	Active tDCS n/N	Sham tDCS n/N	Risk Difference M-H,Random,95% CI	Weight	Risk Difference M-H,Random,95% CI
Cha 2014	0/10	0/10		15.5 %	0.0 [-0.17, 0.17]
Qu 2009	0/25	0/25		84.5 %	0.0 [-0.07, 0.07]
Total (95% CI)	**35**	**35**		**100.0 %**	**0.0 [-0.07, 0.07]**
Total events: 0 (Active tDCS), 0 (Sham tDCS)					
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 0.0$, df = 1 (P = 1.00); $I^2 = 0.0\%$					
Test for overall effect: Z = 0.0 (P = 1.0)					
Test for subgroup differences: Not applicable					

Analysis 3.1. Comparison 3 Subgroup analyses for primary outcome measure: ADLs at the end of the intervention period, Outcome 1 Planned analysis: duration of illness - acute/subacute phase versus postacute phase for ADLs at the end of the intervention period.

Review: Transcranial direct current stimulation (tDCS) for improving activities of daily living, and physical and cognitive functioning, in people after stroke

Comparison: 3 Subgroup analyses for primary outcome measure: ADLs at the end of the intervention period

Outcome: 1 Planned analysis: duration of illness - acute/subacute phase versus postacute phase for ADLs at the end of the intervention period

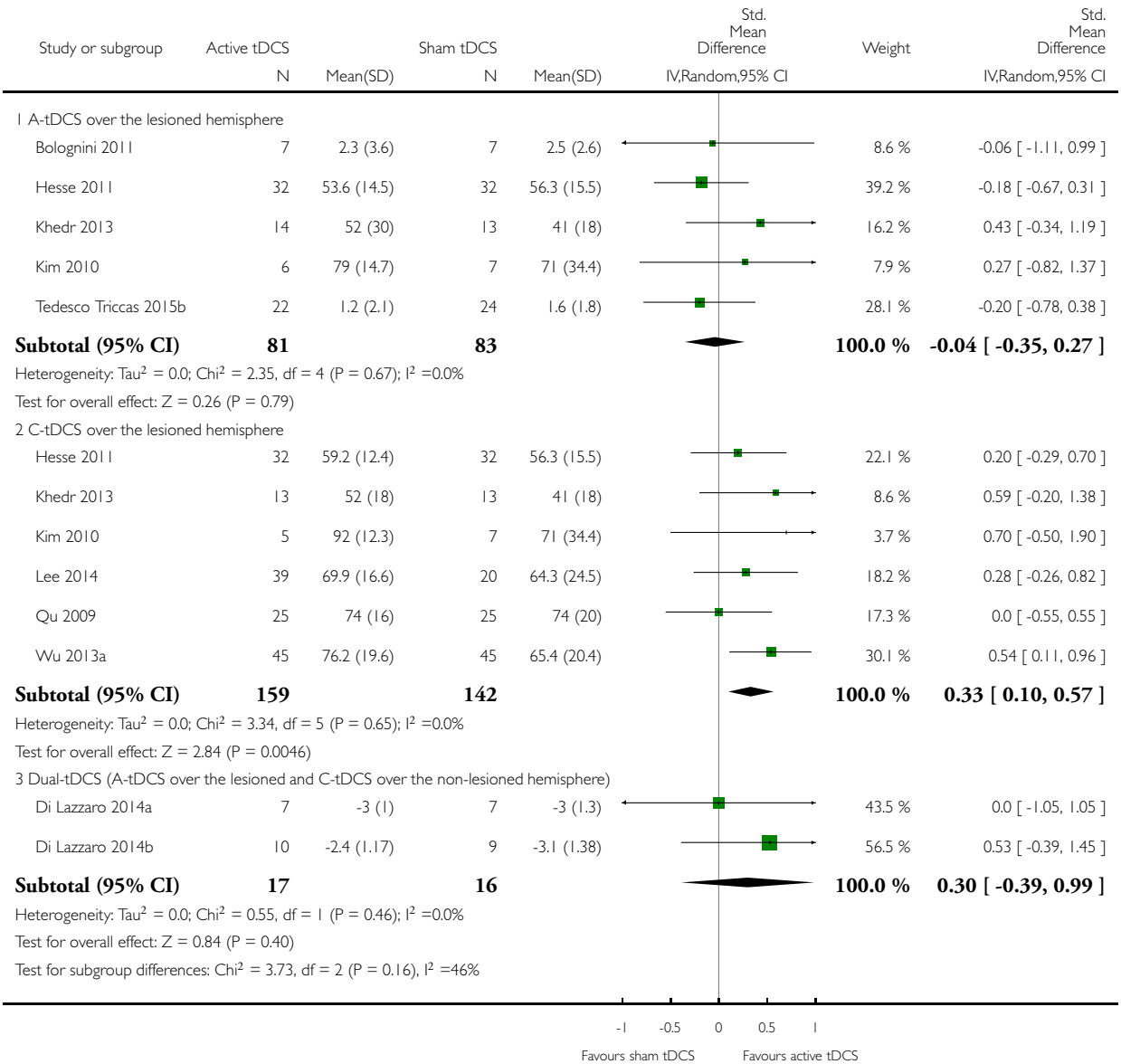
Study or subgroup	Active tDCS N	Mean(SD)	Sham tDCS N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
1 Acute/subacute phase (the first week after stroke and the second to the fourth week after stroke							
Hesse 2011	64	56.4 (13.45)	32	56.3 (15.5)		45.4 %	0.01 [-0.42, 0.43]
Khedr 2013	27	52 (24.5)	13	41 (18)		18.2 %	0.48 [-0.19, 1.15]
Kim 2010	11	86 (14.4)	7	71 (34.4)		8.6 %	0.60 [-0.38, 1.57]
Lee 2014	39	69.9 (16.6)	20	64.3 (24.5)		27.8 %	0.28 [-0.26, 0.82]
Subtotal (95% CI)	**141**		**72**			**100.0 %**	**0.22 [-0.07, 0.51]**
Heterogeneity: Tau² = 0.0; Chi² = 2.15, df = 3 (P = 0.54); I² =0.0%							
Test for overall effect: Z = 1.51 (P = 0.13)							
2 Postacute phase (from the first to the sixth month after stroke)							
Qu 2009	25	74 (16)	25	74 (20)		44.1 %	0.0 [-0.55, 0.55]
Wu 2013a	45	76.2 (19.6)	45	65.4 (20.4)		55.9 %	0.54 [0.11, 0.96]
Subtotal (95% CI)	**70**		**70**			**100.0 %**	**0.30 [-0.22, 0.82]**
Heterogeneity: Tau² = 0.08; Chi² = 2.27, df = 1 (P = 0.13); I² =56%							
Test for overall effect: Z = 1.13 (P = 0.26)							
3 Chronic phase (from the sixth month after stroke)							
Bolognini 2011	7	2.3 (3.6)	7	2.5 (2.6)		15.2 %	-0.06 [-1.11, 0.99]
Di Lazzaro 2014a	7	-3 (1)	7	-3 (1.3)		15.2 %	0.0 [-1.05, 1.05]
Di Lazzaro 2014b	10	-2.4 (1.17)	9	-3.1 (1.38)		19.8 %	0.53 [-0.39, 1.45]
Tedesco Triccas 2015b	22	1.2 (2.1)	24	1.6 (1.8)		49.7 %	-0.20 [-0.78, 0.38]
Subtotal (95% CI)	**46**		**47**			**100.0 %**	**-0.01 [-0.41, 0.40]**
Heterogeneity: Tau² = 0.0; Chi² = 1.73, df = 3 (P = 0.63); I² =0.0%							
Test for overall effect: Z = 0.03 (P = 0.98)							
Test for subgroup differences: Chi² = 1.06, df = 2 (P = 0.59), I² =0.0%							

Analysis 3.2. Comparison 3 Subgroup analyses for primary outcome measure: ADLs at the end of the intervention period, Outcome 2 Planned analysis: effects of type of stimulation (A-tDCS/C-tDCS/dual-tDCS) and location of stimulation (lesioned/non-lesioned hemisphere) on ADLs at the end of the intervention period (study groups collapsed).

Review: Transcranial direct current stimulation (tDCS) for improving activities of daily living, and physical and cognitive functioning, in people after stroke

Comparison: 3 Subgroup analyses for primary outcome measure: ADLs at the end of the intervention period

Outcome: 2 Planned analysis: effects of type of stimulation (A-tDCS/C-tDCS/dual-tDCS) and location of stimulation (lesioned/non-lesioned hemisphere) on ADLs at the end of the intervention period (study groups collapsed)

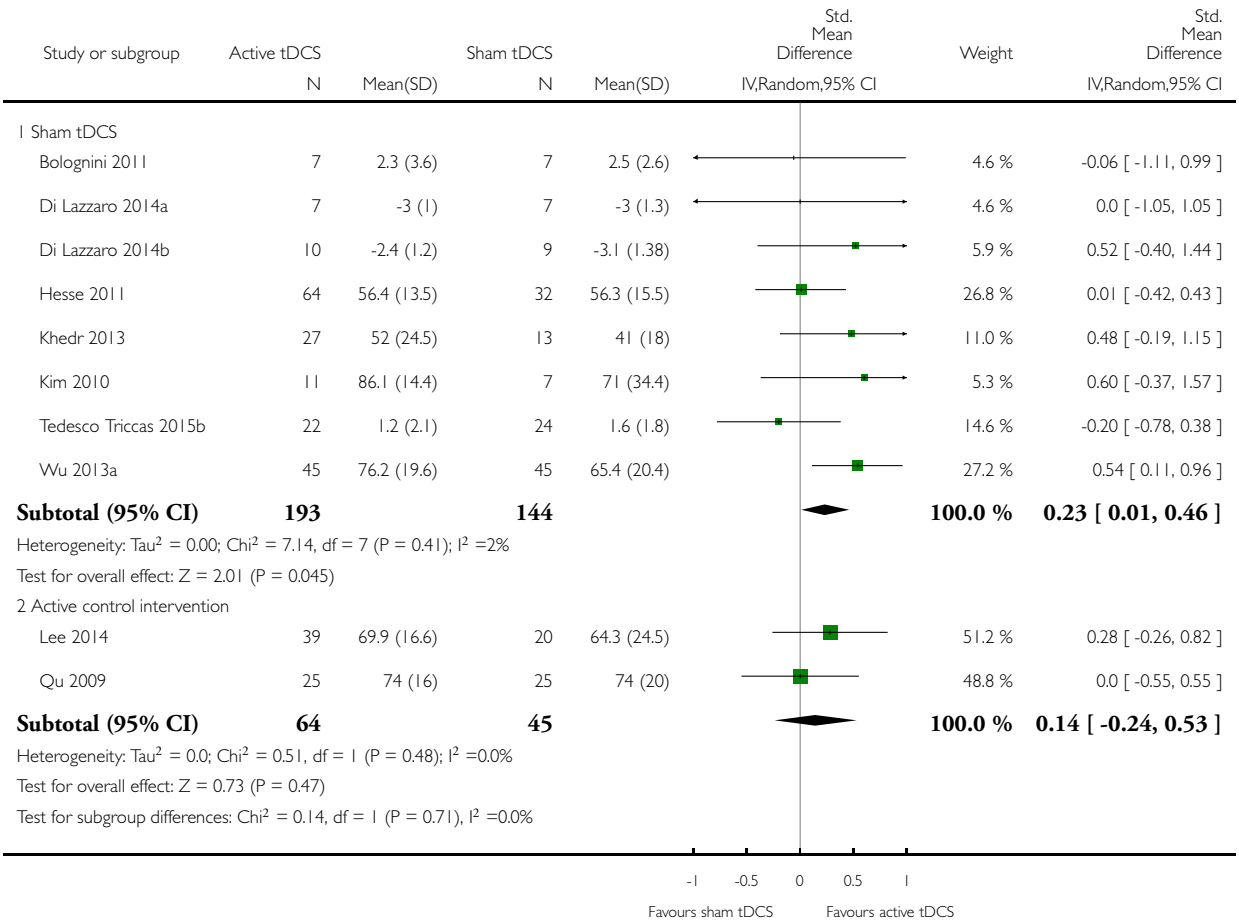


Analysis 3.3. Comparison 3 Subgroup analyses for primary outcome measure: ADLs at the end of the intervention period, Outcome 3 Planned analysis: type of control intervention (sham tDCS, conventional therapy or nothing).

Review: Transcranial direct current stimulation (tDCS) for improving activities of daily living, and physical and cognitive functioning, in people after stroke

Comparison: 3 Subgroup analyses for primary outcome measure: ADLs at the end of the intervention period

Outcome: 3 Planned analysis: type of control intervention (sham tDCS, conventional therapy or nothing)



ADDITIONAL TABLES

Table 1. Patient characteristics

Study ID	Experimental: age, mean (SD)	Control: age, mean (SD)	Experimental: time post-stroke, mean (SD)	Control: time post-stroke, mean (SD)	Experimental: sex, n (%)	Control: sex, n (%)	Experimental: lesioned hemisphere, n (%)	Control: lesioned hemisphere, n (%)	Experimental: severity, mean (SD)	Control: severity, mean (SD)	Experimental: lesion cause/location, n (%)	Control: lesion cause/location, n (%)	Handedness, n (%)
Ang 2012	52 (12) years	56 (10) years	3 (2) years	3 (1) years	4 (40) female	1 (11) female	5 (50)	6 (67)	UE-FM 35 (8)	UE-FM 33 (8)	6 (60) ischaemic; 1 (10) cortical, 9 (90) subcortical	7 (78) ischaemic; 9 (100) subcortical	Not stated
Au-Yeung 2014	63 (6) years		8 (3) years		0 female		5 (50) left		UE-FM 58 (8); MMSE 29 (2)		8 (80) ischaemic		10 (100) right-handed
Boggio 2007a	56 (11) years	75 (NA) years	33 (34) months	39 months	3 (100) male	1 (100) male	2 (67) left	1 (100) left	MRC 4.2 (0.53)	MRC 4.7 (NA)	3 (100) ischaemic and subcortical	1 (100) ischaemic and subcortical	12 (100) right-handed
Bolognir 2011	43 (13) years	51 (15) years	44 (31) months	26 (18) months	4 (57) female	5 (71) female	4 (57) left	4 (57) left	BI 18.13 (2.42)	BI 14.33 (5.46)	2 (29) haemorrhagic, 5 (71) ischaemic	7 (100) ischaemic	14 (100) right-handed
Cha 2014	60 (11) years	58 (10) years	14 (5) months	15 (4) months	Not stated	Not stated	4 (40) left	5 (50) left	Brunnstr 5 (1)	Brunnstr 5 (1)	Not stated	Not stated	Not stated

Table 1. Patient characteristics (*Continued*)

Di Lazzaro 2014a	66 (16) years	71 (14) years	3 (1) days	3 (1) days	2 (29) female	3 (43) female	3 (43) left	3 (43) left	NIHSS 7 (5)	NIHSS 7 (4)	7 (100) ischaemic; 3 (43) subcortical; 4 (57) corticosubcortical	7 (100) ischaemic; 2 (29) subcortical, 5 (71) corticosubcortical	Not stated
Di Lazzaro 2014b	61 (16) years	69 (12) years	3 (2) days	3 (1) days	4 (40) female	6 (60) male	2 (20) left	6 (60) left	NIHSS 6 (3)	NIHSS 6 (2)	10 (100) ischaemic; 4 (40) subcortical, 6 (60) corticosubcortical	10 (100) ischaemic; 4 (40) subcortical, 6 (60) corticosubcortical	Not stated
Fregni 2005a	54 (17) years		27 (24) months		2 (33) female		3 (50) left		MRC 4.18 (0.37)		Cause not clearly stated by the authors		6 (100) right-handed
Fusco 2013a	44 (16) years	65 (22) years	31 (13) days	25 (5) days	3 (60) female	1 (25) female	3 (60) left	2 (50) left	Grasp force 17.83 (7.45) kg		5 (100) ischaemic	3 (75) ischaemic, 1 (25) haemorrhagic	9 (100) right-handed
Fusco 2014	56 (15) years	60 (12) years	19 (8) days		3 (60) female	3 (50) female	2 (40) left	2 (33) left	BI 33 (22)	BI 51 (34)	5 (100) ischaemic	6 (100) ischaemic	9 (73) right-handed
Geroin 2011	64 (7) years	63 (6) years	26 (6) months	27 (5) months	2 (20) female	4 (40) female	Not stated by	Not stated by	ESS 79.6 (4.1)	ESS 79.6	10 (100)	10 (100)	Not stated

Table 1. Patient characteristics (*Continued*)

							the authors	the authors		(2.7)	ischaemic 4 (40) cortical, 3 (30) corticosubcortical, 3 (30) subcortical	ischaemic 5 (50) cortical, 3 (30) corticosubcortical, 2 (20) subcortical	by the authors
Hesse 2011	65 (10) years	66 (10) years	4 (2) weeks	4 (2) weeks	26 (41) female	11 (34) female	35 (55) left	16 (50) left	BI 34.15 (6.97); UEFM 7.85 (3.58)	BI 35.0 (7.8); UEFM 8.2 (4.4)	64 (100) ischaemic; 29 (45) TACI, 20 (31) PACI, 15 (23) LACI	32 (100) ischaemic; 13 (41) TACI, 13 (41) PACI, 6 (18) LACI	Not stated by the authors
Jo 2008	48 (9) years		2 (1) months		3 (30) female		10 (100) right		Not reported		4 (40) ischaemic		Not stated by the authors
Kang 2008a	70 (3) years		544 (388) days		4 (40) female		7 (70) right		21 (1) MMSE		7 (70) ischaemic		Not stated by the authors
Khedr 2013	59 (9) years	57 (8) years	13 (5) days	13 (5) days	9 (33) female	5 (38) female	12 (44) left	6 (46) left	BI 32.76 (10.75)	BI 31.1 (12.6)	27 (100) ischaemic; 12 (44) cortical, 5	13 (100) ischaemic; 6 (42) cortical, 3	Not stated by the authors

Table 1. Patient characteristics (*Continued*)

											(19) corticosubcortical, 10 (37) subcortical	(23) corticosubcortical, 4 (31) subcortical	
Kim 2009	63 (13) years		6 (3) weeks		7 (70) female		8 (80) left		MRC between 3 and 5 for the all paretic finger flexors and extensors		8 (80) infarction, 2 (20) haemorrhage		Not stated by the authors
Kim 2010	54 (15) years	63 (9) years	27 (21) days	23 (8) days	2 (18) female	3 (43) female	7 (64) left	2 (29) left	BI 71.77 (23.86) UE-FM 34.7 (15.0)	BI 67.9 (22.4) UE-FM 41.0 (13.0)	11 (100) ischaemic; 3 (27) cortical, 3 (27) corticosubcortical, 5 (71) subcortical	7 (100) ischaemic; 2 (29) cortical, 1 (14) corticosubcortical, 4 (57) subcortical	Not stated by the authors
Ko 2008	62 (9) years		29-99 days		5 (33) female		15 (100) right		19 per cent deviation (11)		10 (66) ischaemic		15 (100) right-handed
Lee 2014	62 (11) years	61 (14) years	18 (8) days	17 (6) days	17 (44) female	9 (45) female	19 (49) left	13 (65)	UE-FM 37 (23)	UE-FM 35 (22)	21 (54) ischaemic; 21 (54) cortical; 18 (46) subcortical	14 (70) ischaemic; 10 (50) cortical; 10 (50) subcortical	Not stated by the authors

Table 1. Patient characteristics (*Continued*)

Lindenberg 2010	62 (15) years	56 (13) years	31 (21) months	40 (23) months	2 (20) female	3 (30) female	6 (60) left	7 (70) left	UE-FM 38.2 (13.3)	UE-FM 39.8 (11.5)	10 (100) ischaemic	10 (100) ischaemic	19 (95) right-handed, 1 (5) both-handed
Mahmoudi 2011	61 (14) years		8 (5) months		3 (33) female		6 (60) left, 3 (30) right, 1 (10) brainstem		JTT (without handwriting): 12.3 (7.3) s		10 (100) ischaemic		Not stated by the authors
Nair 2011	61 (12) years	56 (15) years	33 (20) months	28 (28) months	2 (29) female	3 (43) female	3 (43) left	5 (71) left	UE-FM 30 (11)	UE-FM 31 (10)	7 (100) ischaemic; 5 (71) cortical and corticosubcortical, 2 (29) subcortical	7 (100) ischaemic; 4 (56) cortical and corticosubcortical, 3 (43) subcortical	14 (100) right-handed
Park 2013	65 (14) years	66 (11) years	29 (19) days	25 (17) days	6 (67) female	2 (40) female	2 (33) left	2 (40) left	NIHSS 8 (3)	NIHSS 10 (3)	4 (67) ischaemic	3 (60) ischaemic	Not stated by the authors
Qu 2009	45 (11) years	45 (14) years	6 (range 3 to 36) months	4 (range 3 to 12) months	4 (16) female	3 (12) female	14 (56) left	13 (52) left	BI 64 (17)	BI 72 (22)	10 (40) haemorrhagic, 15 (60) infarction	10 (40) haemorrhagic, 15 (60) infarction	Not stated by the authors
Rossi 2013	66 (14) years	70 (14) years	2 days	2 days	13 (52) female	11 (44) female	18 (72) left	16 (64) left	UE-FM 4.1 (6.4)	FM 4.6 (7.8)	25 (100) ischaemic; 1 (4)	25 (100) ischaemic;	Not stated by the au-

Table 1. Patient characteristics (*Continued*)

											corti-cal, 17 (68) corti-cosub-cor-tical, 7 (28) sub-corti-cal	2 (8) corti-cal, 18 (72) corti-cosub-corti-cal, 5 (20) sub-corti-cal	thors
Sohn 2013	58 (15) years		63 (17) days		2 (18) female		6 (55) left		Not stated by the authors		4 (36) ischaemic		Not stated by the au-thors
Sun-woo 2013	63 (13) years		28 (60) months		6 (60) female		10 (100) left		MMSE 28 (2)		7 (70) ischaemic		10 (100) right-handed
Tahtis 2012	67 (12) years	56 (12) years	20 (5) days	25 (11) days	2 (29) female	1 (14) female	3 (43) left	3 (43) left	MRS 2 (1)	MRS 3 (1)	7 (100) is-chaemic; 4 (57) corti-cal, 3 (43) sub-corti-cal	7 (100) is-chaemic; 3 (43) corti-cal; 4 (57) sub-corti-cal	Not stated by the au-thors
Tedesco Triccas 2015b	64 (10) years	63 (14) years	25 (31) months	13 (16) months	5 (42) female	4 (33) female	6 (50) left	5 (45) left	UE-FM 28 (19)	UE-FM 37 (14)	3 (25) is-chaemic; 3 (25) corti-cal, 9 (75) sub-corti-cal	9 (81) is-chaemic; 4 (36) corti-cal; 7 (64) sub-corti-cal	22 (96) right-handed
Viana 2014	56 (10) years	55 (12) years	32 (18) months	35 (20) months	1 (10) female	3 (30) female	5 (50) left	3 (30) left	UE-FM 41	UE-FM 39	9 (90) is-	10 (100)	19 (95)

Table 1. Patient characteristics (*Continued*)

									(16)	(17)	chaemic	is-chaemic	right-handed
Wang 2014	54 (14) years	52 (9) years	Not explicitly stated, but all participants were enrolled between 1 and 4 weeks poststroke		1 (16) female	1 (33) female	2 (33) left	0 left	FIM 59 (18)	FIM 74 (8)	6 (100) is-chaemic	3 (100) is-chaemic	Not stated by the authors
Wu 2013a	46 (11) years	49 (13) years	5 (3) months	5 (3) months	11 (24) female	10 (22) female	24 (53) left	23 (51) left	BI 55 (range 0 to 85) UE-FM 12.3 (5.5)	BI 55 (range 25 to 95) UE-FM 11.8 (8.2)	27 (60) is-chaemic, 18 (40) haem-or-rhagic	26 (58) is-chaemic, 19 haem-or-rhagic (42)	Not stated by the authors

BBT: Box and Block Test
BI: Barthel Index
ESS: European Stroke Scale
JTT: Jebsen Taylor Hand Function Test
LACI: lacunar stroke
MRC: Medical Research Council
NA: not applicable
NIHSS: National Institute of Health Stroke Scale
PACI: partial anterior circulation stroke
SD: standard deviation
TACI: total anterior circulation stroke
UE-FM: Upper Extremity Fugl-Meyer Score

Table 2. Demographics of studies, including dropouts and adverse events

Study ID	Type of intervention/ stimulation (polarity)	Electrode position and size	Reference electrode position	Treatment intensity		Base treatment	Dropouts	Adverse events	Source of information
Ang 2012	Dual-tDCS	Saline-soaked sponge electrodes with the anode placed over M1 of the affected hemisphere and the cathode placed over M1 the unaffected hemisphere (size		1 mA for 20 minutes	20 minutes of Dual-tDCS or sham tDCS followed by 8	60 minutes of therapy using EEG-based MI-BCI with	None	Not described by the authors	Published

Table 2. Demographics of studies, including dropouts and adverse events (*Continued*)

		not stated)			minutes of evaluation prior to base treatment	robotic feedback with the MIT-Manus 5 times a week for 2 weeks			
	Sham tDCS			1 mA for 30 seconds					
Au-Yeung 2014	A-tDCS	Saline-soaked 35 cm² sponge electrodes over the M1 of the lesioned hemisphere	Over the contralateral supraorbital forehead	1 mA for 20 minutes	A-tDCS, C-tDCS and sham tDCS once in random order with at least 5 days washout period	None	None	Not described by the authors	Published
	C-tDCS	Saline-soaked 35 cm² sponge electrodes over the M1 of the non-lesioned hemisphere		1 mA for 20 minutes					
	Sham tDCS	Saline-soaked 35 cm² sponge electrodes over M1 of both hemispheres		1 mA for 10 seconds					
Boggio 2007a	A-tDCS	Saline-soaked 35 cm² sponge electrodes over the M1 of the lesioned	Over the contralateral supraorbital forehead	1 mA for 20 minutes	A-tDCS, C-tDCS or sham tDCS 4 days once a day	None	None	None	Published

Table 2. Demographics of studies, including dropouts and adverse events (*Continued*)

		hemisphere							
	C-tDCS	Saline-soaked 35 cm² sponge electrodes over the M1 of the non-lesioned hemisphere							
	Sham tDCS	Not described by the authors		1 mA for 30 seconds					
Bolognini 2011	A-tDCS	Saline-soaked 35 cm² sponge electrodes; with the anode placed over M1 of the lesioned hemisphere and the cathode over M1 of the non-lesioned hemisphere		2 mA for 40 minutes	Base treatment + A-tDCS or sham tDCS 5 days a week for 2 consecutive weeks	CIMT up to 4 hours/day for 5 days a week for 2 consecutive weeks	7 (33%) due to frustration and tiredness during assessments (Bolognini 2013 [pers comm]) ; these participants have been excluded from analysis and presentation of results	None	Published and unpublished
	Sham tDCS			2 mA for 30 seconds					
Cha 2014	A-tDCS	Water-soaked 35 cm² sponge electrodes over M1 of the lesioned hemisphere	Over the contralateral supraorbital forehead	1 mA for 20 minutes	Base treatment + A-tDCS for 20 minutes	Basic training for improving function of upper and lower extremities for 30 minutes	None	Not reported	Published

Table 2. Demographics of studies, including dropouts and adverse events (*Continued*)

						per day, 5 times a week for four weeks			
	PT	NA		NA	NA				
Di Lazzaro 2014a	Dual-tDCS	anode over M1 of the lesioned hemisphere and cathode over M1 of the non-lesioned hemisphere,		2 mA for 40 min	Dual-tDCS or sham tDCS on 5 continuous days	None	None	Not reported	Published
	Sham tDCS			2 mA for 30 sec					
Di Lazzaro 2014b	Dual-tDCS	anode over M1 of the lesioned hemisphere and cathode over M1 of the non-lesioned hemisphere,		2 mA for 40 min	Base treatment + dual-tDCS or sham tDCS on 5 continuous days	CIMT for at least 90% of waking hours, including 1.5 hours per day arm training	None	Not reported	Published
	Sham tDCS			2 mA for 30 sec					
Fusco 2013a	A-tDCS	Saline-soaked 35 cm² sponge electrodes over the M1 of the lesioned hemisphere	Over the contralateral supraorbital forehead	1.5 mA for 15 minutes	1 active tDCS (A-tDCS, C-tDCS, dual-tDCS) and 1 sham tDCS session in 2 consecutive days	None	None	None	Published and unpublished
	C-tDCS	Saline-soaked 35 cm² sponge electrodes over the M1 of the non-lesioned hemisphere		1.5 mA for 15 minutes					

Table 2. Demographics of studies, including dropouts and adverse events (*Continued*)

	Dual-tDCS	Saline-soaked 35 cm² sponge electrodes with the anode over M1 of the lesioned hemisphere and the cathode over M1 of the non-lesioned hemisphere		1.5 mA for 15 minutes					
	Sham tDCS	Not described by the authors							
Fusco 2014	C-tDCS	Saline-soaked 35 cm² gel-sponge electrodes with the cathode over M1 of the non-lesioned hemisphere	Above the right shoulder	1.5 mA for 10 min	Each participant underwent C-tDCS and sham tDCS on 5 consecutive days each week for 2 weeks prior to a rehabilitative session in randomised order	Patient-tailored motor rehabilitation focusing on recovery of upper limb for 45 minutes twice a day	2 (14%); reasons not described by the authors	Not reported	Published
	Sham tDCS			not described			1 (7%); emergency transfer to another hospital		
Fregni 2005a	A-tDCS	Saline-soaked 35 cm² sponge electrodes over the M1 of the lesioned hemisphere	Over the contralateral supraorbital forehead	1 mA for 20 minutes	Each participant underwent A-tDCS, C-tDCS and sham tDCS once, separated by at least 48 hours of rest	None	None	None	Published
	C-tDCS	Saline-soaked 35 cm² sponge electrodes over the M1 of the non-le-		1 mA for 20 minutes					

Table 2. Demographics of studies, including dropouts and adverse events (*Continued*)

		sioned hemi-sphere							
	Sham tDCS	Not described by the authors		1 mA for 30 seconds					
Geroin 2011	A-tDCS	Saline-soaked 35 cm² sponge electrodes over M1 of the lesioned hemi-sphere	Over the contralateral supraorbital forehead	1.5 mA for 7 minutes	Base treatment + A-tDCS or sham tDCS 5 days a week for 2 consecutive weeks	50-minute training sessions 5 days a week for 2 consecutive weeks, consisting of 20 minutes of robot-assisted gait training and 30 minutes of lower limb strength and joint mobilisation training	None	None	Published
	Sham tDCS			0 mA for 7 minutes					
Hesse 2011	A-tDCS	Saline-soaked 35 cm² sponge electrodes over M1 of the lesioned hemi-sphere	Over the contralateral supraorbital forehead	2 mA for 20 minutes	Base treatment + A-tDCS, C-tDCS or sham tDCS 5 days a week for 6 consecutive weeks	20 minutes of robot-assisted arm training 5 days a week for 6 consecutive weeks	11 (11%); 7 dropouts in the EXP-groups: 1 (14%) during intervention period due to pneumonia and 6 (86%) until 3 months of follow-up (2 deaths due to myocardial	None	Published

Table 2. Demographics of studies, including dropouts and adverse events (*Continued*)

							infarction and stent surgery, 3 due to being unavailable and 1 due to refusal of further enrolment); 4 dropouts in the CTL group: 3 (75%) due to being not available and 1 (25%) due to refusal of further enrolment		
	C-tDCS	Saline-soaked 35 cm² sponge electrodes over M1 of the non-lesioned hemisphere		2 mA for 20 minutes					
	Sham tDCS	As in the A-tDCS or the C-tDCS group (changing consecutively)		0 mA for 20 minutes					
Jo 2008	A-tDCS	Saline-soaked 25 cm² sponge electrodes over DLPFC of the non-lesioned hemisphere	Over the contralateral supraorbital forehead	2 mA for 30 minutes	A-tDCS once and sham tDCS once or vice versa, separated by at least 48 hours of resting period	None	None	6 Quote: "Transient aching or burning sensations were reported in six cases, and transient skin redness at the electrode contact site was re-	Published

Table 2. Demographics of studies, including dropouts and adverse events (*Continued*)

								ported in three cases. "	
	Sham tDCS			2 mA for 10 seconds					
Kang 2008a	A-tDCS	25 cm² electrodes over the left DLPFC	Over the contralateral supraorbital forehead	2 mA for 20 minutes	A-tDCS and sham tDCS or vice versa, separated by at least 48 hours of resting period	None	Not described	Not described	Published
	Sham tDCS	25 cm² electrodes over the left DLPFC	Over the contralateral supraorbital forehead	2 mA for 1 minute					
Khedr 2013	A-tDCS	Saline-soaked 35 cm² sponge electrodes, anode over M1 of the lesioned hemisphere	Over the contralateral supraorbital forehead	2 mA for 25 minutes	Base treatment + A-tDCS, C-tDCS or sham tDCS for 6 consecutive days after	Rehabilitation program within 1 hour after each tDCS session, starting with passive movement and range of motion exercise up to active resistive exercise	None	None	Published
	C-tDCS	Saline-soaked 35 cm² sponge electrodes, cathode over M1 of the non-lesioned hemi-	Over the contralateral supraorbital forehead	2 mA for 25 minutes					

Table 2. Demographics of studies, including dropouts and adverse events (*Continued*)

		sphere							
	Sham tDCS	Saline-soaked 35 cm² sponge electrodes, anode over M1 of the lesioned hemisphere	Over the contralateral supraorbital forehead	2 mA for 2 minutes					
Kim 2009	A-tDCS	Saline-soaked 25 cm² sponge electrodes, anode over M1 of the lesioned hemisphere	Over the contralateral supraorbital forehead	1 mA for 20 minutes	Each participant underwent A-tDCS and sham tDCS, separated by at least 24 hours of rest	None	None	None	Published and unpublished
	Sham tDCS			1 mA for 30 seconds					
Kim 2010	A-tDCS	Saline-soaked 25 cm² sponge electrodes over M1 of the lesioned hemisphere (as confirmed by MEP)	Over the contralateral supraorbital forehead	2 mA for 20 minutes	Base treatment + A-tDCS, C-tDCS or sham tDCS 5 days a week for 2 consecutive weeks at the beginning of each therapy session	Occupational therapy according to a standardised protocol aimed at improving paretic hand function for 30 minutes 5 days a week for 2 consecutive weeks	2 of 20; 1 participant discontinued treatment because of dizziness and another because of headache (authors did not state corresponding groups)	2	Published
	C-tDCS	Saline-soaked 25 cm² sponge electrodes over M1 of the non-le-	Over the contralateral supraorbital forehead	2 mA for 20 minutes					

Table 2. Demographics of studies, including dropouts and adverse events (*Continued*)

		sioned hemisphere (confirmed by MEP)							
	Sham tDCS	Saline-soaked 25 cm² sponge electrodes over M1 of the lesioned hemisphere (confirmed by MEP)	Over the contralateral supraorbital forehead	2 mA for 1 minutes					
Ko 2008	A-tDCS	Saline-soaked 25 cm² surface sponge electrodes over right (lesioned) PPC	Over the contralateral supraorbital forehead	2 mA for 20 minutes	A-tDCS once and sham tDCS once or vice versa, separated by at least 48 hours of resting period	None	Not described	None	Published
	Sham tDCS		Over the contralateral supraorbital forehead	2 mA for 10 seconds					
Lee 2014	C-tDCS	Saline-soaked 25 cm² surface sponge electrodes over hand area of M1 of the non-lesioned hemisphere	Over the contralateral supraorbital forehead	2 mA for 20 minutes	20 minutes per day, 5 times per week for 3 weeks	Occupational therapy for 30 minutes per day, 5 times per week for 3 weeks	3 of 42 (7%); 2 medical problems; 1 refused to participate	No major adverse events	Published
						Virtual reality			

Table 2. Demographics of studies, including dropouts and adverse events (*Continued*)

						therapy for 30 minutes per day, 5 times per week for 3 weeks			
	Virtual Reality	NA		NA	NA	Virtual reality only for 30 minutes per day, 5 times per week for 3 weeks	2 of 22 (9%); 1 refused to participate; 1 early discharge		
Lindenberg 2010	Dual-tDCS	Saline-soaked 16.3 cm² sponge electrodes with the anode over M1 of the lesioned hemisphere and the cathode over M1 of the non-lesioned hemisphere		1.5 mA for 30 minutes	Base treatment + dual-tDCS or sham tDCS at 5 consecutive sessions on 5 consecutive days	Physical and occupational therapy sessions at 5 consecutive sessions on 5 consecutive days for 60 minutes, including functional motor tasks	None	None	Published
	Sham tDCS			1.5 mA for 30 seconds					
Mahmoudi 2011	A-tDCS1	Saline-soaked 35 cm² sponge electrodes, anode over M1 of the lesioned hemisphere	Over the contralateral orbit	1 mA for 20 minutes	Each participant underwent A-tDCS1, A-tDCS2, C-tDCS, dual-tDCS and sham tDCS once with a wash-out period of at least 96 hours	None	None	Not clearly stated, most likely none	Published

Table 2. Demographics of studies, including dropouts and adverse events (*Continued*)

	A-tDCS2	Saline-soaked 35 cm² sponge electrodes, anode over M1 of the lesioned hemisphere	On the contralateral deltoid muscle	1 mA for 20 minutes				
	C-tDCS	Saline-soaked 35 cm² sponge electrodes, cathode over M1 of the non-lesioned hemisphere	Over M1 of the lesioned hemisphere	1 mA for 20 minutes				
	Dual-tDCS	Saline-soaked 35 cm² sponge electrodes with the anode over M1 of the lesioned hemisphere and the cathode over M1 of the non-lesioned hemisphere		1 mA for 20 minutes				
	Sham tDCS	Not described by the authors		1 mA for 30 seconds				
Nair 2011	C-tDCS	Saline-soaked sponge electrodes with the cathode over M1 of the lesioned hemisphere	Over the contralateral supraorbital forehead	1 mA for 30 minutes	Base-treatment + C-tDCS or sham tDCS for 5 consecutive daily sessions, each at the beginning of the base treatment sessions	Occupational therapy (PNF; shoulder abduction, external rotation, elbow extension, forearm pronation) for 5 consec-	None	None	Published

Table 2. Demographics of studies, including dropouts and adverse events (*Continued*)

						utive daily sessions (60 minutes each)			
	Sham tDCS	Not described by the authors		For 30 minutes					
Park 2013	A-tDCS	Sponge electrodes with the anode positioned over the bilateral prefrontal cortex	at the non-dominant arm	2 mA for 30 minutes	Base-treatment + A-tDCS or sham tDCS for 5 days a week for approximately 18 days	Computer-assisted cognitive rehabilitation (CACR) with the ComCog program (15 minute attention and 15 minute memory training)	Unclear	None	Published
	Sham tDCS			2 mA for 30 seconds					
Qu 2009	C-tDCS	Saline-soaked 18 cm² sponge electrodes over primary sensorimotor cortex of the lesioned hemisphere	Unclear	0.5 mA for 20 minutes, once a day for 5 consecutive days for 4 weeks		NA	None	None	Published
	PT	NA		Physical therapy according to the Bobath, Brunnstrom and Rood approaches for 40 minutes twice a day for 5 consecutive days for 4 weeks					
Rossi 2013	A-tDCS	Saline-soaked 35 cm²	Over the contralateral	2 mA for 20 minutes	Once a day for 5 consecu-	Not described by	None	None	Published

Table 2. Demographics of studies, including dropouts and adverse events (*Continued*)

		sponge electrodes over M1 of the lesioned hemisphere	supraorbital forehead		tive days	the authors			
	Sham tDCS			2 mA for 30 seconds					
Sohn 2013	A-tDCS	25 cm² sponge electrodes over M1 of the affected hemisphere	Not described	2 mA for 10 minutes	A-tDCS or sham tDCS once	None	Unclear	Unclear	Published
	Sham tDCS			2 mA for 20 seconds					
Sunwoo 2013	Dual-tDCS	Saline-soaked 25 cm² sponge electrodes over the right posterior parietal cortex (PPC) plus cathodal tDCS over the left PPC	Over the contralateral supraorbital forehead	1 mA for 20 minutes	Each participant underwent dual-tDCS, A-tDCS and sham tDCS once with a wash-out period of at least 24 hours	None	None	3 (30%) suffered from mild headache after dual-tDCS, which disappeared spontaneously	Published
	A-tDCS	Saline-soaked 25 cm² sponge electrodes over the right PPC plus sham tDCS over the left PPC		For A-tDCS: 1 mA for 20 minutes For sham tDCS: 1 mA for 10 seconds					
	Sham tDCS	Saline-soaked 25 cm² sponge electrodes		1 mA for 10 seconds					

Table 2. Demographics of studies, including dropouts and adverse events (*Continued*)

		over the right PPC plus sham tDCS over the left PPC							
Tahtis 2012	Dual-tDCS	Saline-soaked 25 cm² electrodes with the anode placed over the leg area of the lesioned hemisphere and the cathode placed over leg area of the non-lesioned hemisphere	Not described	2 mA for 15 minutes	Dual-tDCS or sham tDCS once	None	Unclear	None	Published
	Sham tDCS			2 mA for < 30 seconds					
Tedesco Triccas 2015b	A-tDCS	Saline-soaked 35 cm² sponge electrodes with the anode placed over M1 of the affected hemisphere	Over the contralateral supraorbital forehead	1 mA for 20 minutes	Base therapy plus tDCS or sham tDCS for 18 sessions during 8 weeks (approximately 2 to 3 sessions per week)	Robotic arm training with the ArmeoSpring device (60 minutes per session) for 18 sessions during 8 weeks (approximately 2 to 3 sessions per week)	1 out of 12 (8%) in the A-tDCS group due to a skin reaction after receiving four sessions of A-tDCS	6 out of 12 (50%) in the A-tDCS group reported adverse events such as pain, burning or headache after receiving A-tDCS	Published/unpublished
	Sham tDCS			1 mA for 20 seconds					
Viana 2014	A-tDCS	Saline-soaked 35 cm² sponge electrodes with	Over the contralateral supraorbital forehead	2 mA for 13 minutes	Base therapy + A-tDCS or sham tDCS	Virtual reality training using Nintendo Wii	None	None	Published

Table 2. Demographics of studies, including dropouts and adverse events (*Continued*)

		the anode placed over M1 of the affected hemi-sphere	head		3 times a week for 5 weeks	(Games used: Wii Sports resort, Wii Play Motion, Let's Tap) aiming at move-ments of shoulder, elbow, wrist, hand and fingers; each game was played for 15 minutes (total time per training session: 60 minutes) ; passive stretching exercises were performed before and after each training session			
	Sham tDCS			2 mA for 30 seconds					
Wang 2014	Dual-tDCS	35 cm^2 elec-trodes with the anode placed over M1 of the affected hemi-sphere	Over con-tralateral M1	1 mA for 20 minutes	Dual-tDCS or sham-tDCS once	Placebo methylpheni 1 hour prior to stimula-tion	Unclear	No major adverse events; 3 par-ticipants (50%) from the dual-tDCS group reported mild tingling sensation	Published

Table 2. Demographics of studies, including dropouts and adverse events (*Continued*)

						20 mg MP 1 hour prior to stimulation		with tDCS stimulation	
	Sham-tDCS			1 mA for 10 seconds					
Wu 2013a	C-tDCS	Saline-soaked 24.75 cm² sponge electrodes over primary sensorimotor cortex of the lesioned hemisphere	Over the shoulder on the unaffected side	1.2 mA for 20 minutes	Once daily 5 days a week for 4 weeks	Quote: "Both groups received a conventional physical therapy program for 30 minutes twice daily, including maintaining good limb position, chronic stretching via casting or splinting, physical modalities and techniques, and movement training"	None	None	Published
	Sham tDCS			1.2 mA for 30 seconds					

A-tDCS: anodal direct current stimulation
C-tDCS: cathodal direct current stimulation
CIMT: constraint-induced movement therapy
Dual-tDCS: A-tDCS and C-tDCS simultaneously
EEG: electroencephalography
M1: primary Motor Cortex
MEP: motor-evoked potentials
MI-BCI: motor imagery brain-computer interface
MP: methylphenidate

NA: not applicable
PNF: proprioceptive neuromuscular facilitation
PPC: posterior parietal cortex
PT: physical therapy
SD: standard deviation
tDCS: transcranial direct current stimulation

Table 3. Sensitivity analyses for comparison 1.1: primary outcome of ADL performance at the end of the intervention period

Sensitivity analysis	Studies included in analysis	Effect estimate
All studies with proper allocation concealment	Hesse 2011; Khedr 2013; Kim 2010; Tedesco Triccas 2015b; Wu 2013a	(SMD 0.24, 95% CI -0.07 to 0.56; participants = 290; studies = 5; I^2 = 36%; inverse variance method with random-effects model)
All studies with proper blinding of outcome assessor for primary outcome absolute values	Bolognini 2011; Di Lazzaro 2014a; Di Lazzaro 2014b; Hesse 2011; Khedr 2013; Kim 2010; Lee 2014; Tedesco Triccas 2015b; Wu 2013a	(SMD 0.24, 95% CI 0.03 to 0.44; participants = 396; studies = 9; I^2 = 0%; inverse variance method with random-effects model)
All studies with proper blinding of outcome assessor for primary outcome change values	Fusco 2014	(SMD 0.46, 95% CI -0.75 to 1.67; participants = 11; studies = 1; I^2 = 0%; inverse variance method with random-effects model)
All studies with intention-to-treat analysis	Di Lazzaro 2014a; Di Lazzaro 2014b; Hesse 2011; Khedr 2013; Wu 2013a	(SMD 0.31, 95% CI 0.05 to 0.56; participants = 259; studies = 5; I^2 = 0%; inverse variance method with random-effects model)

CI: confidence interval
SMD: standardised mean difference

Table 4. Sensitivity analyses for comparison 1.2: primary outcome of ADL performance at the end of follow-up at least 3 months after the end of the intervention period

Sensitivity analysis	Studies included in analysis	Effect estimate
All studies with proper allocation concealment	Hesse 2011; Khedr 2013; Kim 2010; Tedesco Triccas 2015b	(SMD 0.30, 95% CI -0.15 to 0.75; participants = 199; studies = 4; I^2 = 51%; inverse variance method with random-effects model)
All studies with proper blinding of outcome assessor for primary outcome	Di Lazzaro 2014b; Hesse 2011; Khedr 2013; Kim 2010; Rossi 2013; Tedesco Triccas 2015b	(SMD 0.31, 95% CI 0.01 to 0.62; participants = 269; studies = 6; I^2 = 27%; inverse variance method with random-effects model)

Table 4. Sensitivity analyses for comparison 1.2: primary outcome of ADL performance at the end of follow-up at least 3 months after the end of the intervention period (*Continued*)

All studies with intention-to-treat analysis	Di Lazzaro 2014b; Hesse 2011; Khedr 2013; Rossi 2013	(SMD 0.38, 95% CI 0.05 to 0.70; participants = 205; studies = 4; I^2 = 16%; inverse variance method with random-effects model)

CI: confidence interval
SMD: standardised mean difference

APPENDICES

Appendix 1. CENTRAL search strategy

#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 embolism and thrombosis"] or [mh "intracranial hemorrhages"] or [mh ^stroke] or [mh "brain infarction"] or [mh ^"vertebral artery dissection"]
#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
#3 ((brain* or cerebr* or cerebell* or intracran* or intracerebral) near/5 (isch*emi* or infarct* or thrombo* or emboli* or occlus*)):ti,ab
#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
#5 [mh ^hemiplegia] or [mh paresis]
#6 (hemipleg* or hemipar* or paresis or paretic or hemineglect or "hemi-neglect" or ((unilateral or spatial or hemi*spatial or visual) near/5 neglect)):ti,ab
#7 #1 or #2 or #3 or #4 or #5 or #6
#8 [mh ^"Electric Stimulation Therapy"]
#9 [mh ^"Electric Stimulation"]
#10 [mh Êlectrodes]
#11 (transcranial near/5 direct current near/5 stimulation):ti,ab
#12 (transcranial near/5 DC near/5 stimulation):ti,ab
#13 (transcranial near/5 electric* near/5 stimulation):ti,ab
#14 (tDCS or A-tDCS or C-tDCS or S-tDCS or electrode* or anode or anodes or anodal or cathode or cathodes or cathodal):ti,ab
#15 #8 or #9 or #10 or #11 or #12 or #13 or #14
#16 #7 and #15
Number of records retrieved: 484

Appendix 2. MEDLINE (Ovid SP) search strategy

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 embolism and thrombosis"/ or exp intracranial hemorrhages/ or stroke/ or exp brain infarction/ or vertebral artery dissection/
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 intracran$ or intracerebral) adj5 (isch?emi$ or infarct$ or thrombo$ or emboli$ or occlus$)).tw.
4. ((brain$ or cerebr$ or cerebell$ or intracerebral or intracranial or subarachnoid) adj5 (haemorrhage$ or hemorrhage$ or haematoma$ or hematoma$ or bleed$)).tw.
5. hemiplegia/ or exp paresis/
6. (hemipleg$ or hemipar$ or paresis or paretic or hemineglect or hemi-neglect or ((unilateral or spatial or hemi?spatial or visual) adj5 neglect)).tw.
7. or/1-6
8. Electric Stimulation Therapy/
9. Electric Stimulation/
10. Electrodes/
11. (transcranial adj5 direct current adj5 stimulation).tw.
12. (transcranial adj5 DC adj5 stimulation).tw.
13. (transcranial adj5 electric$ adj5 stimulation).tw.
14. (tDCS or A-tDCS or C-tDCS or S-tDCS or electrode$ or anode or anodes or anodal or cathode or cathodes or cathodal).tw.
15. or/8-14
16. Randomized Controlled Trials as Topic/
17. random allocation/
18. Controlled Clinical Trials as Topic/
19. control groups/
20. clinical trials as topic/ or clinical trials, phase i as topic/ or clinical trials, phase ii as topic/ or clinical trials, phase iii as topic/ or clinical trials, phase iv as topic/
21. double-blind method/
22. single-blind method/
23. Placebos/
24. placebo effect/
25. cross-over studies/
26. randomized controlled trial.pt.
27. controlled clinical trial.pt.
28. (clinical trial or clinical trial phase i or clinical trial phase ii or clinical trial phase iii or clinical trial phase iv).pt.
29. (random$ or RCT or RCTs).tw.
30. (controlled adj5 (trial$ or stud$)).tw.
31. (clinical$ adj5 trial$).tw.
32. ((control or treatment or experiment$ or intervention) adj5 (group$ or subject$ or patient$)).tw.
33. (quasi-random$ or quasi random$ or pseudo-random$ or pseudo random$).tw.
34. ((control or experiment$ or conservative) adj5 (treatment or therapy or procedure or manage$)).tw.
35. ((singl$ or doubl$ or tripl$ or trebl$) adj5 (blind$ or mask$)).tw.
36. (cross-over or cross over or crossover).tw.
37. (placebo$ or sham).tw.
38. trial.ti.
39. (assign$ or allocat$).tw.
40. controls.tw.
41. or/16-40
42. 7 and 15 and 41
43. exp animals/ not humans.sh.
44. 42 not 43
45. limit 44 to ed=20130501-20150227

Number of hits: 193

Appendix 3. EMBASE (Ovid SP) search strategy

1. cerebrovascular disease/ or exp basal ganglion hemorrhage/ or exp brain hematoma/ or exp brain hemorrhage/ or exp brain infarction/ or exp brain ischemia/ or exp carotid artery disease/ or cerebral artery disease/ or exp cerebrovascular accident/ or exp intracranial aneurysm/ or exp occlusive cerebrovascular disease/ or stroke patient/
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 intracran$ or intracerebral) adj5 (isch?emi$ or infarct$ or thrombo$ or emboli$ or occlus$)).tw.
4. ((brain$ or cerebr$ or cerebell$ or intracerebral or intracranial or subarachnoid) adj5 (haemorrhage$ or hemorrhage$ or haematoma$ or hematoma$ or bleed$)).tw.
5. hemiparesis/ or hemiplegia/ or paresis/
6. (hemipleg$ or hemipar$ or paresis or paretic or hemineglect or hemi-neglect or ((unilateral or spatial or hemi?spatial or visual) adj5 neglect)).tw.
7. or/1-6
8. transcranial direct current stimulation/
9. electrostimulation therapy/ or nerve stimulation/ or electrostimulation/
10. electrode/
11. (transcranial adj5 direct current adj5 stimulation).tw.
12. (transcranial adj5 DC adj5 stimulation).tw.
13. (transcranial adj5 electric$ adj5 stimulation).tw.
14. (tDCS or A-tDCS or C-tDCS or S-tDCS or electrode$ or anode or anodes or anodal or cathode or cathodes or cathodal).tw.
15. or/8-14
16. Randomized Controlled Trial/ or "randomized controlled trial (topic)"/
17. Randomization/
18. Controlled clinical trial/ or "controlled clinical trial (topic)"/
19. control group/ or controlled study/
20. clinical trial/ or "clinical trial (topic)"/ or phase 1 clinical trial/ or phase 2 clinical trial/ or phase 3 clinical trial/ or phase 4 clinical trial/
21. Crossover Procedure/
22. Double Blind Procedure/
23. Single Blind Procedure/ or triple blind procedure/
24. placebo/ or placebo effect/
25. (random$ or RCT or RCTs).tw.
26. (controlled adj5 (trial$ or stud$)).tw.
27. (clinical$ adj5 trial$).tw.
28. ((control or treatment or experiment$ or intervention) adj5 (group$ or subject$ or patient$)).tw.
29. (quasi-random$ or quasi random$ or pseudo-random$ or pseudo random$).tw.
30. ((control or experiment$ or conservative) adj5 (treatment or therapy or procedure or manage$)).tw.
31. ((singl$ or doubl$ or tripl$ or trebl$) adj5 (blind$ or mask$)).tw.
32. (cross-over or cross over or crossover).tw.
33. (placebo$ or sham).tw.
34. trial.ti.
35. (assign$ or allocat$).tw.
36. controls.tw.
37. or/16-36
38. 7 and 15 and 37
39. (exp animals/ or exp invertebrate/ or animal experiment/ or animal model/ or animal tissue/ or animal cell/ or nonhuman/) not (human/ or normal human/ or human cell/)
40. 38 not 39
41. limit 40 to dd=20130501-20150227

Number of records retrieved: 496

Appendix 4. CINAHL search strategy (EBSCO)

S1 .(MH "Cerebrovascular Disorders") OR (MH "Basal Ganglia Cerebrovascular Disease+") OR (MH "Carotid Artery Diseases+") OR (MH "Cerebral Ischemia+") OR (MH "Cerebral Vasospasm") OR (MH "Intracranial Arterial Diseases+") OR (MH "Intracranial Embolism and Thrombosis") OR (MH "Intracranial Hemorrhage+") OR (MH "Stroke") OR (MH "Vertebral Artery Dissections")
S2 .(MH "Stroke Patients") OR (MH "Stroke Units")
S3 .TI (stroke or poststroke or post-stroke or cerebrovasc* or brain vasc* or cerebral vasc or cva or apoplex or SAH) or AB (stroke or poststroke or post-stroke or cerebrovasc* or brain vasc* or cerebral vasc or cva or apoplex or SAH)
S4 .TI (brain* or cerebr* or cerebell* or intracran* or intracerebral) or AB (brain* or cerebr* or cerebell* or intracran* or intracerebral)
S5 .TI (ischemi* or ischaemi* or infarct* or thrombo* or emboli* or occlus*) or AB (ischemi* or ischaemi* or infarct* or thrombo* or emboli* or occlus*)
S6 .S4 and S5
S7 .TI (brain* or cerebr* or cerebell* or intracerebral or intracranial or subarachnoid) or AB (brain* or cerebr* or cerebell* or intracerebral or intracranial or subarachnoid)
S8 .TI (haemorrhage* or hemorrhage* or haematoma* or hematoma* or bleed*) or AB (haemorrhage* or hemorrhage* or haematoma* or hematoma* or bleed*)
S9 .S7 and S8
S10 .(MH "Hemiplegia")
S11 .TI (hemipleg* or hemipar* or paresis or paretic) or AB (hemipleg* or hemipar* or paresis or paretic)
S12 .(MH "Unilateral Neglect") OR (MH "Unilateral Neglect (Saba CCC)") OR (MH "Unilateral Neglect (NANDA)")
S13 .TI ((unilateral or spatial or hemispatial or hemi-spatial or visual) N5 neglect) or AB ((unilateral or spatial or hemispatial or hemi-spatial or visual) N5 neglect)
S14 .S1 OR S2 OR S3 OR S6 OR S9 OR S10 OR S11 OR S12 OR S13
S15 .(MH "Electric Stimulation") OR (MH "Electrical Stimulation, Functional") OR (MH "Electrical Stimulation, Neuromuscular") OR (MH "Electrodes")
S16 .TI (transcranial N5 direct current N5 stimulation) OR AB (transcranial N5 direct current N5 stimulation)
S17 .TI (transcranial N5 electric N5 stimulation) OR AB (transcranial N5 electric N5 stimulation)
S18 .TI (tDCS or A-tDCS or C-tDCS or S-tDCS or electrode* or anode or anodes or anodal or cathode or cathodes or cathodal) OR AB (tDCS or A-tDCS or C-tDCS or S-tDCS or electrode* or anode or anodes or anodal or cathode or cathodes or cathodal)
S19 .S15 OR S16 OR S17 OR S18
S20 .(MH "Randomized Controlled Trials") or (MH "Random Assignment") or (MH "Random Sample+")
S21 .(MH "Clinical Trials") or (MH "Intervention Trials") or (MH "Therapeutic Trials")
S22 .(MH "Double-Blind Studies") or (MH "Single-Blind Studies") or (MH "Triple-Blind Studies")
S23 .(MH "Control (Research)") or (MH "Control Group") or (MH "Placebos") or (MH "Placebo Effect")
S24 .(MH "Crossover Design") OR (MH "Quasi-Experimental Studies")
S25 .PT (clinical trial or randomized controlled trial)
S26 .TI (random* or RCT or RCTs) or AB (random* or RCT or RCTs)
S27 .TI (controlled N5 (trial* or stud*)) or AB (controlled N5 (trial* or stud*))
S28 .TI (clinical* N5 trial*) or AB (clinical* N5 trial*)
S29 .TI ((control or treatment or experiment* or intervention) N5 (group* or subject* or patient*)) or AB ((control or treatment or experiment* or intervention) N5 (group* or subject* or patient*))
S30 .TI ((control or experiment* or conservative) N5 (treatment or therapy or procedure or manage*)) or AB ((control or experiment* or conservative) N5 (treatment or therapy or procedure or manage*))
S31 .TI ((singl* or doubl* or tripl* or trebl*) N5 (blind* or mask*)) or AB ((singl* or doubl* or tripl* or trebl*) N5 (blind* or mask*))
S32 .TI (cross-over or cross over or crossover) or AB (cross-over or cross over or crossover)
S33 .TI (placebo* or sham) or AB (placebo* or sham)
S34 .TI trial
S35 .TI (assign* or allocat*) or AB (assign* or allocat*)
S36 .TI controls or AB controls
S37 .TI (quasi-random* or quasi random* or pseudo-random* or pseudo random*) or AB (quasi-random* or quasi random* or pseudo-random* or pseudo random*)

S38 .S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27 OR S28 OR S29 OR S30 OR S31 OR S32 OR S33 OR S34 OR S35 OR S36 OR S37
S39 .S14 AND S19 AND S38
S40 .EM 201305-
S41 .S39 AND S40
Number of records retrieved: 73

Appendix 5. AMED (OvidSP) search strategy

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 intracran$ or intracerebral) adj5 (isch?emi$ or infarct$ or thrombo$ or emboli$ or occlus$)).tw.
4. ((brain$ or cerebr$ or cerebell$ or intracerebral or intracranial or subarachnoid) adj5 (haemorrhage$ or hemorrhage$ or haematoma$ or hematoma$ or bleed$)).tw.
5. hemiplegia/
6. (hemipleg$ or hemipar$ or paresis or paretic or hemineglect or hemi-neglect or ((unilateral or spatial or hemi?spatial or visual) adj5 neglect)).tw.
7. or/1-6
8. electric stimulation/ or functional electric stimulation/ or electrotherapy/
9. (transcranial adj5 direct current adj5 stimulation).tw.
10. (transcranial adj5 DC adj5 stimulation).tw.
11. (transcranial adj5 electric$ adj5 stimulation).tw.
12. (tDCS or A-tDCS or C-tDCS or S-tDCS or electrode$ or anode or anodes or anodal or cathode or cathodes or cathodal).tw.
13. or/8-12
14. 7 and 13
15. limit 14 to up=201305-201503
Number of hits: 42

Appendix 6. Web of Science search strategy

#1.TS=(stroke or poststroke or post-stroke or cerebrovasc* or brain vasc* or cerebral vasc* or cva* or apoplex* or SAH)
#2.TS=((brain* or cerebr* or cerebell* or intracran* or intracerebral) NEAR/5 (isch$emi* or infarct* or thrombo* or emboli* or occlus*))
#3.TS=((brain* or cerebr* or cerebell* or intracerebral or intracranial or subarachnoid) NEAR/5 (haemorrhage* or hemorrhage* or haematoma* or hematoma* or bleed*))
#4.TS=(hemipleg* or hemipar* or paresis or paretic or hemineglect or hemi-neglect)
#5.TS=((unilateral or spatial or hemi$spatial or visual) NEAR/5 neglect)
#6.#5 OR #4 OR #3 OR #2 OR #1
#7.TS=(transcranial NEAR/5 “direct current” NEAR/5 stimulation)
#8.TS=(transcranial NEAR/5 “DC” NEAR/5 stimulation)
#9.TS=(transcranial NEAR/5 electric* NEAR/5 stimulation)
#10.TS=(tDCS or A-tDCS or C-tDCS or S-tDCS or electrode* or anode or anodes or anodal or cathode or cathodes or cathodal)
#11.#10 OR #9 OR #8 OR #7
#12.TS=(random* or RCT or RCTs)
#13.TS=(controlled NEAR/5 (trial* or stud*))
#14.TS=(clinical* NEAR/5 trial*)
#15.TS=((control or treatment or experiment* or intervention) NEAR/5 (group* or subject* or patient*))
#16.TS=(quasi-random* or quasi random* or pseudo-random* or pseudo random*)
#17.TS=((control or experiment* or conservative) NEAR/5 (treatment or therapy or procedure or manage*))
#18.TS=((singl* or doubl* or tripl* or trebl*) NEAR/5 (blind* or mask*))
#19.TS=(cross-over or cross over or crossover)
#20.TS=(placebo* or sham)
#21.TI=trial

#22.TS=(assign* or allocat*)
#23.TS=controls
#24.#23 OR #22 OR #21 OR #20 OR #19 OR #18 OR #17 OR #16 OR #15 OR #14 OR #13 OR #12
#25.#24 AND #11 AND #6
Number of records retrieved: 996

Appendix 7. PEDro search strategy

Abstract & Title: stroke
Therapy: electrotherapies, heat, cold
Subdiscipline: neurology
Method: clinical trial
(Search terms matched with AND)
New records added since: 01/05/2013
Number of records retrieved: 67

Appendix 8. RehabDATA search strategy

Find results with all of the words: stroke
Where Abstract OR Title contains transcranial OR tDCS
Year of publication between 2013 and 2015
Number of records retrieved: 29

Appendix 9. COMPENDEX search strategy (Dialog)

s1 s ((vertebral (w) artery (w) dissection?)) or brain or carotid or intracran?
s2 s stroke? or poststroke? or cerebr? or cva? or apoplex? or sah
s3 s cerebell? or intracerebral or subarachnoid
s4 s hemipleg? or hemipar? or paresis or paretic
s5 s s1-s4
s6 s ((electric (w) stimulation?)) or electrode?
s7 s transcranial (5n) direct (5n) current (5n) stimulation?
s8 s transcranial (5n) DC (5n) stimulation?
s9 s transcranial (5n) electric? (5n) stimulation?
s10 s tdcs or electrode? or anod? or cathod?
s11 s s6-s10
s12 s randomized (w) controlled (w) trial?
s13 s random (w) allocation
s14 s control (w) group?
s15 s clinical (w) trial?
s16 s blind (w) method?
s17 s placebo?
s18 s investigat? and therap???
s19 s research (5n) design
s20 s evaluation (w) stud???
s21 s ((evaluation (w) stud???)) or ((comparative (w) stud???))
s22 s random?
s23 s ((controlled (5n) trial?)) or ((controlled (5n) stud???))
s24 s (control or treatment or experiment? or intervention?) (5n) (group? or subject? or patient?)
s25 s (multicent??? or therapeutic) (5n) (trial? or stud???)
s26 s (control or experiment$ or conservative) (5n) (treatment or therap??? or procedure? or manage?)

s27 s (singl? or doubl? or tripl? or trebl?) (5n) (blind? or mask?)
s28 s (flip??? or toss?) (5n) coin
s29 s versus
s30 s ((cross (w) over)) or crossover)
s31 s sham
s31 s ((multiple (w) baseline)) or assign? or alternate or allocate? or counterbalance?
s33 s control? ?
s34 s s12-s33
s35 s s5 and s11 and s34
Number of records retrieved (until March 2013): 1024

Appendix 10. INSPEC via TecFinder

Advanced search: Stroke AND tDCS
Number of hits: 11

WHAT'S NEW

Last assessed as up-to-date: 27 February 2015.

Date	Event	Description
28 September 2015	New citation required and conclusions have changed	The conclusions have changed: there is evidence of an effect of transcranial direct current stimulation for improving activities of daily living, but not for arm function
28 September 2015	New search has been performed	The scope of the updated review has broadened since the previous version. This was in response to a request from the Cochrane Stroke Group to incorporate evidence relating to cognitive function (including neglect) into this update. We have rerun and expanded the searches to February 2015 and revised the text as appropriate. We have included 32 trials involving 748 participants in this update compared with 15 trials with 455 participants in the last version of this review from 2013

CONTRIBUTIONS OF AUTHORS

All review authors contributed to the conception and design of the protocol and approved the final draft of the review.

All review authors participated in all stages of the review. BE was involved in screening titles and abstracts of publications identified by the searches; BE and JM extracted trial and outcome data from the selected trials and analysed outcome data. JM and MP were involved in assessing the methodological quality of the studies. All review authors participated in interpreting the results.

DECLARATIONS OF INTEREST

Two review authors (Jan Mehrholz and Marcus Pohl) were involved in conducting and analysing the largest of the included trials (Hesse 2011).

Bernhard Elsner: none known.

Joachim Kugler: none known.

SOURCES OF SUPPORT

Internal sources

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External sources

- No sources of support supplied

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

We calculated risk differences (RDs) instead of risk ratios (RRs) for binary outcomes because of the low rates of dropouts and adverse events.

INDEX TERMS

Medical Subject Headings (MeSH)

*Activities of Daily Living; *Stroke Rehabilitation; Electric Stimulation Therapy [*methods]; Motor Activity [physiology]; Randomized Controlled Trials as Topic; Recovery of Function

MeSH check words

Adult; Humans