Physical fitness training for stroke patients

Physical fitness training for stroke patients (Review)

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This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2009, Issue 4

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[Intervention Review]

Physical fitness training for stroke patients

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Editorial group: Cochrane Stroke Group.
Publication status and date: New search for studies and content updated (conclusions changed), published in Issue 4, 2009.
Review content assessed as up-to-date: 31 March 2009.

Citation: Saunders DH, Greig CA, Mead GE, Young A. Physical fitness training for stroke patients. *Cochrane Database of Systematic Reviews* 2009, Issue 4. Art. No.: CD003316. DOI: 10.1002/14651858.CD003316.pub3.

ABSTRACT

Background

Physical fitness is low after stroke. It is unknown whether improving physical fitness after stroke reduces disability.

Objectives

To determine whether fitness training (cardiorespiratory or strength, or both) after stroke reduces death, dependence and disability. The secondary aims were to determine the effects of fitness training on physical fitness, mobility, physical function, health status and quality of life, mood and incidence of adverse events.

Search strategy

We searched the Cochrane Stroke Group Trials Register (last searched March 2009), the Cochrane Central Register of Controlled Trials (*The Cochrane Library* Issue 1, 2007), MEDLINE (1966 to March 2007), EMBASE (1980 to March 2007), CINAHL (1982 to March 2007), and six additional databases to March 2007. We handsearched relevant journals and conference proceedings, and screened bibliographies. We searched trials registers and contacted experts in the field.

Selection criteria

We included randomised controlled trials if the aim of the intervention was to improve muscle strength or cardiorespiratory fitness, or both, and if the control groups comprised either no intervention, usual care or a non-exercise intervention.

Data collection and analysis

Two review authors determined trial eligibility and quality. One review author extracted outcome data at end of intervention and follow-up scores, or as change from baseline scores. Diverse outcome measures limited the intended analysis.

Main results

We included 24 trials, involving 1147 participants, comprising cardiorespiratory (11 trials, 692 participants), strength (four trials, 158 participants) and mixed training interventions (nine trials, 360 participants). Death was infrequent at the end of the intervention (1/1147) and follow up (8/627). No dependence data were reported. Diverse disability measures made meta-analysis difficult; the majority of effect sizes were not significant. Cardiorespiratory training involving walking, improved maximum walking speed (mean difference (MD) 6.47 metres per minute, 95% confidence interval (CI) 2.37 to 10.57), walking endurance (MD 38.9 metres per six minutes, 95% CI 14.3 to 63.5), and reduced dependence during walking (Functional Ambulation Categories MD 0.72, 95% CI 0.46 to 0.98). Current data include few strength training trials, and lack non-exercise attention controls, long-term training and follow up.

Authors' conclusions

The effects of training on death, dependence and disability after stroke are unclear. There is sufficient evidence to incorporate cardiorespiratory training, involving walking, within post-stroke rehabilitation in order to improve speed, tolerance and independence during walking. Further trials are needed to determine the optimal exercise prescription after stroke and identify any long-term benefits.

PLAIN LANGUAGE SUMMARY

Physical fitness training for stroke patients

Little is known about whether fitness training is beneficial for stroke patients. Physical fitness is important for the performance of everyday activities. The physical fitness of stroke patients is impaired after their stroke and this may reduce their ability to perform everyday activities and exacerbate any stroke-related disability. This review of 24 trials involving 1147 participants found that cardiorespiratory fitness training after stroke can improve walking performance. There are too few data for other reliable conclusions to be drawn.

BACKGROUND

Little is known about the effectiveness of interventions that are aimed at improving the physical fitness of stroke patients. This review will aim to establish whether physical fitness training is beneficial to stroke patients when provided during or after their rehabilitation or ward care and, in particular, whether it is associated with a reduction in death, dependence, and disability.

What is physical fitness?

'Physical activity' describes all bodily movement that is produced by the contraction of skeletal muscle and which substantially increases energy expenditure (USDHHS 1996). This includes the muscular work required to maintain posture, to walk, to perform activities of daily living, and for occupational, leisure and sporting activities. Any temporary and involuntary reduction in the ability of muscle to generate force or sustain repeated contractions, or both, during and after physical activity is termed 'fatigue'. Physical fitness is a set of attributes, that people have or achieve, which relates to the ability to perform physical activity (USDHHS 1996). The key components of physical fitness include the following.

Cardiorespiratory fitness

This relates to an individual's ability to perform physical activity for an extended period. It is conferred by the central capacity of the circulatory and respiratory systems to supply oxygen (USDHHS 1996), and the peripheral capacity of skeletal muscle to utilise oxygen (Saltin 1980).

Muscular strength

This is the maximum force that can be generated by a specific muscle or muscle group. The ability to sustain repeated muscular actions or a single static contraction is termed 'muscular endurance' (USDHHS 1996).

Body composition

This includes total and regional bone mineral density, and the relative amounts and distribution of adipose tissue, muscle and other vital parts of the body (USDHHS 1996).

All three components of physical fitness can adapt to changes in physical activity. Physical fitness is improved by activity and impaired by inactivity.

Physical fitness in patients after stroke

Ageing and disease: pre-existing impairments

Prior to their stroke, many patients already have impaired physical fitness. This is because many stroke patients are elderly, and will therefore have already experienced the decline in cardiorespiratory fitness and muscle function that occurs with normal ageing (Harridge 2000; Malbut-Shennan 2000; Skelton 1999). In addition, many stroke patients have co-existing physical diseases that are associated with impaired physical fitness.

Hemiparesis: a direct effect

The hemiparesis that may occur after stroke can dramatically reduce the amount of muscle mass available for contraction during physical activity. This, therefore, imposes an immediate impairment in physical fitness and can prevent, or increase the difficulty of, everyday tasks such as walking. The slower speeds of locomotion seen in patients with hemiparesis (30 metres per minute) incur approximately the same oxygen cost (10 millilitres per kilogram per minute) (Hash 1978) as healthy people walking approximately twice as fast (60 metres per minute) (Waters 1999); thus the hemiparetic gait is energetically very inefficient.

Reduced mobility: an indirect effect

Acute stroke often reduces mobility as a result of neurological deficits such as motor weakness, ataxia, apraxia, impaired consciousness levels, and sometimes as a result of sensory and visuospatial deficits (Warlow 1996). This often leads to a reduction in physical activity, which in turn further reduces physical fitness.

In healthy people, reduced mobility through bed rest, habitual inactivity or joint immobilisation (for example, with a cast) leads to a rapid loss of physical fitness. For example, bed rest for three weeks in healthy young adults leads to a 25% reduction in maximum oxygen uptake (VO_2 max), a measure of cardiorespiratory fitness (Saltin 1968). Cast immobilisation causes a local reduction in muscle strength of 3% to 4% in healthy people within one week (Appell 1990), and is accompanied by muscular atrophy and changes in local muscle metabolism (MacDougall 1977). Inactivity or immobility can cause loss of muscle, an increase in body fat, and a reduction in bone mineral density in all people (Roche 1996).

In stroke patients there appear to be no data examining the relationship between reduced physical activity post stroke, and loss of cardiorespiratory fitness. After stroke, limb muscle strength is usually impaired: the deficit is greater on the paretic side, but some effect is seen bilaterally (Andrews 2000), suggesting that stroke patients' immobility, as well as hemiparesis, reduces muscle strength. After stroke there is a progressive reduction in the bone mineral density of upper and lower body limbs on both the paretic, and to a lesser extent, the normal side (Liu 1999), suggesting that a general reduction in mobility contributes to a reduction in bone mineral density.

In summary, hemiplegia increases the demands of physical activity, while age, hemiparesis and reduced physical fitness impair the ability to perform muscular work and the capacity to tolerate it. Therefore, even whilst carrying out everyday tasks, stroke patients may need to draw upon a high proportion of their maximum capability to perform muscular work, leaving little in reserve. This will render physical activity more fatiguing and uncomfortable, and may even prevent it being performed at all.

Physical fitness training (Training)

'Physical fitness training' (or training) is defined as a planned, structured regimen of regular physical exercise deliberately performed to improve one or more components of physical fitness (USDHHS 1996). Training is structured such that the physical demands of the intervention progressively increase: that is, the intensity (rate of energy expenditure), frequency or duration, or both, of the exercise increase throughout the programme. Training interventions are typically targeted at the improvement or maintenance of either cardiorespiratory fitness, or strength and muscular endurance (ACSM 1998). Both types of training intervention can be employed concurrently and both have the capacity to modify body composition. Importantly, any improvements in the three components of physical fitness are transient and reversible: that is, when training is discontinued, physical fitness deteriorates to pre-training levels.

For people who are already healthy, there is an association between physical activity, including exercise, and long-term health benefits (USDHHS 1996). Epidemiological data indicate that physical activity may reduce the risk of stroke, ischaemic heart disease, diabetes, hypertension, osteoporosis and cancer (Booth 2000). Regular physical activity, including exercise, can enhance quality of life and improve the low physical fitness associated with old age (Young 2001).

People with a variety of existing diseases may benefit from training that forms part of their rehabilitation (Young 2001). Training has also been employed in the rehabilitation of people with heart failure, neuromuscular disease, diabetes mellitus, arthritis, spinal cord injury, osteoporosis and in the treatment of obesity (Frontera 1999).

Given that healthy people and those with different chronic diseases all benefit from physical activity and training, it is plausible that stroke patients may also benefit. Improvements in physical fitness may improve gait, balance, and motor control; which may, in turn, improve mobility, reduce the risk of falls and fractures, reduce disability and improve quality of life. For example, improvements in cardiorespiratory fitness may compensate for the increased energy requirement of the hemiparetic gait by conferring a smaller relative demand during ambulation (Macko 1997; Waters 1999). It has been argued that improvements in cardiorespiratory fitness might also reduce the risk of subsequent cardiovascular and cerebrovascular events (Goldberg 1988). It should be noted that physical activity, and training in particular, may be associated with some adverse effects. Accordingly, we will investigate the risks of training-induced soft tissue injuries, altered muscle tone, falls and vascular events as part of this review.

OBJECTIVES

Primary objectives

The three primary objectives of this review were to determine whether stroke patients allocated training compared with controls, at any time after the onset of their stroke, were less likely to be:

1. dead;
2. dead or dependent; or
3. disabled at the end of intervention or the end of follow up.

Secondary objectives

1. Determine the effect of training on secondary outcome measures

(See: Types of outcome measures)

To assess outcomes at the end of intervention or the scheduled end of follow up. This may be at some defined point during the training or some weeks or months after the training is complete, or both.

2. Determine the effect of factors which could influence the primary and secondary outcome measures

(See: Subgroup analyses)

(a) Effect of the 'dose' of training, including:

- whether the frequency, intensity and duration of training sessions exceeded or fell below recommended levels for development of fitness (ACSM 1998);
- the degree of progression;
- the duration of the training programme.

(b) Effect of the 'type' of training, including:

- the type of training (e.g. cardiorespiratory or strength training, or both);
- the mode of exercise (e.g. cycling, weight training);
- upper or lower extremity, or both;
- affected or unaffected limb, or both.

(c) Effect of 'timing' of training:

- during usual care versus after usual care.

During usual care refers to training that occurred during inpatient hospital care or stroke rehabilitation, or both. After usual care refers to training that occurred after discharge from hospital and completion of any inpatient or outpatient stroke rehabilitation.

(d) The degree to which benefits or effects were retained:

- duration of training effect;
- effect of measures to facilitate continuation of exercise after the end of intervention.

(e) Effect of initial patient status on outcome measures:

- effect of initial disability on outcome;
- effect of training on ambulatory patients with mild, severe or no hemiparesis.

(f) Effect of physical activity performed by control groups.

(g) Effect of trial quality.

METHODS

Criteria for considering studies for this review

Types of studies

We considered randomised controlled trials (RCTs), single-blinded or open, if the studies made the following comparisons.

Cardiorespiratory training versus control

- At the end of intervention
- At the end of scheduled follow up

Strength training versus control

- At the end of intervention
- At the end of scheduled follow up

Mixed training (cardiorespiratory plus strength) versus control

- At the end of intervention
- At the end of scheduled follow up

Control groups were exposed to either: (1) physical activity occurring during usual care, or (2) 'no training' after usual care. 'No training' included either no intervention or a non-exercise intervention (such as attention control groups or 'sham' exercises). Therefore, we anticipated the following study designs.

- Training plus usual care versus usual care (during usual care).
- Training versus no training (after usual care).

Types of participants

We considered stroke patients of any age if they were considered medically stable enough for training by the trialists. Our intention was to categorise ambulatory patients further into subgroups with mild, severe, or no hemiparesis. We included patients irrespective of the time since the onset of the stroke.

Types of interventions

We included any of the following training interventions.

Cardiorespiratory training

The aim of this type of training is to improve the cardiorespiratory component of fitness. It is typically performed for extended periods of time on devices or ergometers (e.g. treadmill, cycling, rowing), or by utilising modes of activity such as walking or stair climbing.

Strength training

This is performed primarily to improve the strength and muscular endurance component of fitness. It is typically carried out by making repeated muscle contractions resisted by body weight, elastic devices, masses, free weights or specialised machine weights, or isokinetic devices. We also considered concentric, isometric or eccentric contractions of any muscle groups.

Mixed training

This describes training interventions that comprise different activity components: some intended to improve cardiorespiratory fitness and others to improve strength and muscular endurance; for example, a training programme comprising both cycling and weight training.

We only included training interventions if clear evidence was described of an intention to train the participants; that is, a systematic, progressive increase in the intensity or resistance, the frequency or the duration, or both, of exercise throughout the programme. The 'dose' of the cardiorespiratory or strength training components of a programme were individually categorised as falling within or below the ACSM guidelines on developing and maintaining fitness (ACSM 1998). We sought measures of adherence to training, since this can modify the 'dose' of training. For the purposes of this review, adherence included both (1) attendance at training sessions, and (2) compliance with exercise instructions, etc, during training sessions.

Some training programmes may focus the training on either the upper or lower extremities. Since this may influence some of the outcome measures, we included subgroup analyses comparing upper body, lower body and whole body training interventions.

If any description of a training regimen was unclear, we contacted the authors for further information.

Types of outcome measures

We included trials that included any scale measuring relevant domains. We also included trials that incorporated any of the following primary or secondary outcome measures.

Primary outcome measures

1. Case fatality; numbers of deaths from all causes.
2. Death or dependence.
3. Disability.

Secondary outcome measures

Adverse effects

Recurrent non-fatal cardiovascular or cerebrovascular events, altered muscle tone, training-induced injury, incidence of falls, incidence of fractures.

Physical fitness

For example, cardiorespiratory fitness, exercise duration, exercise heart rate and oxygen consumption (VO_2); muscle strength and power output; body composition: bone mineral density, body mass index (BMI), adiposity.

Mobility

For example, gait speed and walking ability.

Physical function

For example, task performance, balance and stair climbing.

Health-related quality of life

Any relevant scale.

Mood

Any relevant scale.

Assessments of outcome occurred at the scheduled end of a training period (end of intervention), or at any other defined point either within the trial or some weeks or months after the training was complete, or both (scheduled end of follow up).

Search methods for identification of studies

See the 'Specialized register' section in the Cochrane Stroke Group module.

We searched the Cochrane Stroke Group Trials Register, which was last searched by the Managing Editor in March 2009. In addition, we searched the following electronic bibliographic databases.

1. Cochrane Central Register of Controlled Trials (*The Cochrane Library* Issue 1, 2007) (OVID).
2. MEDLINE 1966 to March 2007 (OVID).
3. EMBASE 1980 to March 2007 (OVID).

4. CINAHL 1982 to March 2007 (OVID).
5. SPORTDiscus 1949 to March 2007 (OVID).
6. Science Citation Index Expanded 1981 to March 2007 (WOK).
7. Web of Science Proceedings 1982 to March 2007 (WOK).
8. Physiotherapy Evidence Database (PEDro) March 2007 (http://www.pedro.fhs.usyd.edu.au/).
9. REHABDATA 1956 to March 2007 (http://www.naric.com/search/rhab/).
10. Index to UK Theses 1970 to March 2007.

The structure of the searches comprised a generic 'stroke' component, supplemented with search terms for locating studies that related to exercise, physical fitness, cardiorespiratory training or strength training. We limited studies to trials and intervention studies by a further subset of maximally sensitive search strings. The MEDLINE search strategy (Appendix 1) comprised both MESH controlled vocabulary (/) and free text terms (.tw.). We generated an equivalent search strategy for the other databases using the same logic as the MEDLINE search strategy but modified to accommodate differences in indexing and syntax.

Additional measures

1. Recursive searching of references lists of included trials.
2. Citation tracking of included trials using Science Citation Index or OVID Gateway.
3. Examination of proceedings from relevant conferences listed on the Internet Stroke Centre's web site (http://www.strokecenter.org/) including European Stroke Conference (2000 to 2006), International Stroke Conference 2000 to 2007) and the World Stroke Conference (2000 and 2004).
4. Liaison with investigators of identified trials to identify unpublished or ongoing trials.
5. Liaison with investigators involved in relevant physiotherapy reviews for The Cochrane Collaboration (Anne Moseley).
6. Contact with national and international experts and organisations to identify unpublished or ongoing trials.
7. Handsearching journals, particularly those related to exercise and physical fitness that are currently excluded from The Cochrane Collaboration handsearching programme. These included:
    - *Adapted Physical Activity Quarterly* (1984 to 2007);
    - *British Journal of Sports Medicine* (1974 to 2007);
    - *International Journal of Sports Medicine* (1980 to 2007);
    - *Journal of Science and Medicine in Sport* (1998 to 2007);
    - *Research Quarterly for Exercise and Sport* (1985 to 2007); and
    - *Sports Medicine* (1984 to 2007).
8. Identifying ongoing trials using the Internet Stroke Centre's Stroke Trials Directory database (http://www.strokecenter.org/trials/), and the metaRegister of Controlled Trials (http://www.controlled-trials.com/mrct/).

Data collection and analysis

Study selection

One review author (DS) screened the title and abstract (if available) of studies identified by the electronic search strategies, along with correspondence describing any unpublished trials. If the study was potentially relevant, we obtained the full publication. Two review authors (DS plus CG or GM) independently applied the selection criteria to the full publications. A consensus discussion resolved disagreements on whether we included studies in the review. We consulted the fourth review author (AY) if disagreements persisted. For any relevant or potentially relevant trial identified, published in a language other than English, we sought translation through the Cochrane Stroke Group.

Methodological quality assessment

Current guidance from the Cochrane Stroke Group is to avoid quality assessment scales. Therefore, in this review update we omitted the quality assessment scale (Jadad 1996) previously used (Saunders 2004a) and recorded the following information instead.

1. Method of randomisation.
2. Method of allocation concealment'
3. Who was blinded and how successful the blinding was.
4. Whether an intention-to-treat (ITT) analysis was possible.

Data extraction

Two review authors (DS plus CG or GM) independently extracted data. Meta-analysis of continuous variables in the previous version of the review analysed change from baseline: this usually necessitated estimation of variance data (standard deviation of the difference; SD_{diff}). To simplify this updated review and make the analysis more closely reflect the objective, the preferred form of data was outcome data reported at end of intervention or end of follow up, or both. If only change scores with SD_{diff} were reported then we recorded these. The data extracted included, but were not limited to:

- participants: number, sex, stage of care, time since stroke, losses to follow up;

- intervention: type (cardiorespiratory, strength or mixed), mode (e.g. treadmill walking, weight training), dose (intensity, frequency, duration), adherence (attendance, compliance);

- outcome measures (death, dependence, disability, physical fitness, mobility, physical function, health status and quality of life, mood and the incidence of adverse events).

Analysis of results

We carried out statistical analysis using RevMan 5 (RevMan 2008). For dichotomous variables we calculated the individual and pooled statistics using a fixed-effect model and reported them as odds ratio (OR) with 95% confidence intervals (CI). For continuous data we recorded pooled mean differences (MD) with 95% CI. If different scales were employed by different studies for the assessment of the same outcome (i.e. dependence and disability), we calculated standardised mean differences (SMD) with 95% CI. If meta-analyses were included, we carried out tests of homogeneity (Chi^2 statistic) between comparable trials. In all meta-analyses we applied both a fixed-effect and a random-effects model; we considered non-identical results indicative of statistical heterogeneity, and reported the most conservative outcome. Whenever this, and other evidence (Chi^2 $P < 0.1$) of statistical heterogeneity was present, we sought explanations using subgroup analyses. We planned to investigate publication bias with funnel plots of pooled data.

If studies reported only change-from-baseline scores (and SD of the difference) we could pool the data with those reporting end-of-intervention scores (and SD) by using the mean difference.

Diverse outcomes meant some data were unsuitable for meta-analysis. Similar outcomes could be combined using SMD if appropriate; however, we avoided this where necessary; instead we calculated effect sizes for individual study outcomes and summarised them in Table 1 to Table 2.

Table 1. Cardiorespiratory training: individual study data - end of intervention

Outcome	Measure	Study	Participants	Method	Effect Size	Significance
Disability	FIM locomotor subscale	da Cunha 2002	12	MD (fixed), 95% CI	-0.17 [-2.46, 2.12]	NS
Disability	Barthel index	Pohl 2007	155	MD (fixed), 95% CI	13.6 [6.89, 20.31]	P < 0.0001
Disability	Barthel Index > 75	Pohl 2007	155	OR (fixed), 95% CI	3.62 [1.84, 7.10]	P = 0.0002
Disability	Motricity index	Pohl 2007	155	MD (fixed), 95% CI	11.60 [3.54, 19.66]	P = 0.005
Physical function	Timed up and go (seconds)	Salbach 2004	91	MD (fixed), 95% CI	-3.90 [-13.75, 5.95	NS
Physical function	Fugl-Meyer score	Potempa 1995	42	MD (fixed), 95% CI	-10.00 [-15.68, -4.32]	NS
Mood	Anxiety - HADS	Bateman 2001	60	MD (fixed), 95% CI	-1.94 [-3.80, -0.08	NS
Mood	Depression - HADS	Bateman 2001	60	MD (fixed), 95% CI	-1.40 [-3.21, 0.41]	NS
Risk	Body mass (kg)	Bateman 2001	72	MD (fixed), 95% CI	5.38 [-1.69, 12.45	NS

HADS: Hospital anxiety and depression scale
NS: not significant

Table 2. Mixed training: individual study data - end of retention follow up

Outcome	Measure	Study	Participants	Method	Effect Size	Significance
Disability	FIM Instrument	Mead 2007	66	MD (fixed), 95% CI	0.20 [-1.88, 2.28]	NS
Disability	Nottingham EADL	Mead 2007	66	MD (fixed), 95% CI	0.30 [-0.93, 1.53]	NS
Disability	Rivermead Motor Index	Mead 2007	66	MD (fixed), 95% CI	0.20 [-0.41, 0.81]	NS
Disability	Lawton IADL	Duncan 2003	80	MD (fixed), 95% CI	0.80 [-0.96, 2.56]	NS
Disability	Barthel ADL	Duncan 2003	80	MD (fixed), 95% CI	-1.70 [-5.51, 2.11]	NS
Disability	Barthel ambulation subscale	Richards 2004	62	MD (fixed), 95% CI	-2.00 [-5.13, 1.13]	NS
Disability	FIM cognitive subscale	Duncan 2003	80	MD (fixed), 95% CI	0.40 [-0.25, 1.05]	NS
Disability	FIM motor subscale	Duncan 2003	80	MD (fixed), 95% CI	1.90 [-1.88, 5.68]	NS
Physical fitness	Net gait economy ml/kg/10 metre	Mead 2007	65	MD (fixed), 95% CI	0.00 [-0.02, 0.02]	NS
Physical fitness	Power, LLEP, affected (w/kg)	Mead 2007	65	MD (fixed), 95% CI	0.02 [-0.13, 0.17]	NS
Mobility	Gait endurance (6-MWT)	Dean 2000	9	MD (fixed), 95% CI	16.20 [-175.76, 208.16]	NS
Physical function	Berg Balance	Richards 2004	62	MD (fixed), 95% CI	-2.00 [-5.48, 1.48]	NS
Physical function	Functional reach	Mead 2007	66	MD (fixed), 95% CI	2.50 [-0.97, 5.97]	NS
Health and QoL	SF-36 social function	Duncan 2003	80	MD (fixed), 95% CI	10.60 [0.53, 20.67]	P = 0.04
Mood	Anxiety (HADS)	Mead 2007	66	MD (fixed), 95% CI	-0.25 [-1.79, 1.29]	NS

Table 2. Mixed training: individual study data - end of retention follow up (*Continued*)

Mood	Depression (HADS)	Mead 2007	66	MD (fixed), 95% CI	0.18 [-1.27, 1.63]	NS

6-MWT: 6-Minute Walk Test
EADL: extended activities of daily living
FIM: Functional Independence Measure
HADS: Hospital anxiety and depression scale
Lawton IADL: Lawton instrumental activities of daily living
LLEP: Lower limb extensor power
NS: not significant
QoL: quality of life
SF-36: Short Form 36 questionnaire

We re-analysed data from all included studies as above, not just the new studies added to this update.

Subgroup analyses

Some, but not all, of the secondary objectives could be fulfilled using the following subgroup analyses to compare the effects of:

- training programmes which meet the ACSM guidelines (ACSM 1998) and those that do not;
- long duration (more than 12 weeks) or short duration (less than 12 weeks) training programmes;
- cardiorespiratory, strength, or mixed training;
- different modes of exercise;
- training programmes involving upper or lower limbs, or both;
- training programmes concentrating on affected or unaffected limbs;
- training during usual care or after usual care;
- inclusion of measures to facilitate continuation of exercise between the end of intervention and the scheduled end of follow up;
- mild, severe, or no hemiparesis;
- control groups utilising no intervention, a non-exercise intervention, or other intervention.

Sensitivity analyses

Sensitivity analyses assessed the effect of:

- inclusion of trials in which the review authors considered the control condition or usual care to contain elements that may provide an intentional, or unintentional training effect;
- inclusion of trials examining mixed cardiorespiratory/ strength training of which only one component met or exceeded the ACSM guidelines (ACSM 1998);
- blinding, dropouts and withdrawals.

RESULTS

Description of studies

See: Characteristics of included studies; Characteristics of excluded studies; Characteristics of ongoing studies.

We identified 19 systematic and other reviews that were relevant to fitness training after stroke: the bibliographies of these were screened for trials (Ada 2006; Ada 2007; Andersen 2001; Barreca 2003; Eng 2004; Ernst 1990; Giuliani 1995; Hiraoka 2001; Manning 2003; Meek 2003; Morris 2004; Moseley 2005; Pang 2006a; Ramas 2007; Urton 2007; van de Port 2007; van der Lee 2001; Van Peppen 2004; Wagenaar 1991).

We identified 196 potentially relevant studies (2004 version of the review: 42 studies; this update: 154 studies) on the basis of information in the title and abstract and full papers obtained. Of these:

- 58 studies remain unclassified because they are very recent or require either additional information or translation into English in order to apply the inclusion criteria (Characteristics of studies awaiting classification);
- 96 studies (2004 review: 31 studies; this update: 65 studies) failed to meet inclusion criteria. We excluded the majority because they (1) included an intervention that did not meet the criteria for fitness training, (2) did not use a relevant control, or (3) included physical activity in the control group that could give rise to a training effect (Characteristics of excluded studies);
- 19 trials are ongoing (Characteristics of ongoing studies);
- 23 trials met the inclusion criteria;
- 24 comparisons are described in this review and the details are summarised as 24 separate trials in the Characteristics of included studies table;
- two trials were dissertations (Cuviello-Palmer 1988; James

2002) and nine studies have secondary publications (da Cunha 2002; Eich 2004; Katz-Leurer 2003; Salbach 2004; Winstein 2004; Richards 1993; Duncan 2003; Teixeira 1999; Dean 2000).

Participants

A total of 1147 stroke patients (male to female ratio approximately 3:2) were randomised and attended baseline assessment in the included trials. The mean time since onset of stroke in participants in the trials ranged from 8.8 days in those examining training before discharge from hospital (Richards 1993) to 7.7 years in trials examining training in patients after discharge (Teixeira 1999). The mean age of the patients was approximately 63 years. Two trials (Pohl 2007; Richards 1993) recruited 173 patients who were non-ambulatory at baseline, one trial of 84 participants (Bateman 2001) recruited both ambulatory and non-ambulatory patients (approximately 1:1 ratio), and the remaining trials, involving 868 participants, all recruited ambulatory people with stroke, apart from one trial of 42 participants (Winstein 2004), which is not described.

Interventions

Cardiorespiratory training

Eleven trials (629/1147 participants) (Bateman 2001; Cuviello-Palmer 1988; da Cunha 2002; Eich 2004; Glasser 1986; Katz-Leurer 2003; Pohl 2002a; Pohl 2002b; Pohl 2007; Potempa 1995; Salbach 2004) examined cardiorespiratory training (summarised in Table 3). The studies employed different forms of ergometry (cycle, treadmill or Kinetron) apart from one, which used circuit training (Salbach 2004). These training programmes comprised regular sessions (three days or more per week) of sufficient duration (usually greater than 20 minutes) but the exercise intensity was often not described. In nine of the 11 trials (496/629 participants) the cardiorespiratory training commenced during usual care: of these, three of the 11 trials (190/629 participants) were in the acute phase less than one month post-stroke (Cuviello-Palmer 1988; da Cunha 2002; Pohl 2007).

Table 3. Cardiorespiratory training interventions

Study	Training mode	During/ after usual care	Upper/ lower body	Specific training	Intensity	Duration	Frequency	Programme length	ACSM criteria met
Glasser 1986	Kinetron	During	Lower	No	UN	20 to 60	5	3	UN
Cuveillo-Palmer 1988	Kinetron	During	Lower	No	HR < resting + 20 beats/ minute	7 to 17	5	3	No
da Cunha 2002	BWS treadmill	During	Lower	Yes	UN	20	5	2 to 3	UN
Pohl 2002a	Treadmill	During	Lower	Yes	UN	30	3	4	UN
Pohl 2002b	Treadmill	During	Lower	Yes	UN	30	3	4	UN
Eich 2004b	Treadmill	During	Lower	Yes	60% HRR	30	5	6	Yes
Pohl 2007	BWS gait trainer	During	Lower	Yes	UN	20	5	4	UN
Bateman 2001	Cycle ergometer	Both	Lower	No	60% to 80%	≤ 30	3	12	Yes

Table 3. Cardiorespiratory training interventions (*Continued*)

					ARHRM				
Katz-Leurer 2003a	Cycle ergometer	Both	Lower	No	≤ 60% HRR	20 then 30	5 then 3	2 then 6 (total 8)	Yes
Potempa 1995	Cycle ergometer	After	Lower	No	30% to 50% max effort	30	3	10	Yes
Salbach 2004	Circuit training	After	Lower	Yes	UN	55	3	6	UN

ARHRM: age-related heart rate maximum
BWS: body weight supported
HR: heart rate
HRR: heart rate reserve
UN: unknown

Strength training

Four trials (158/1147 participants) (Inaba 1973; Kim 2001; Ouellette 2004; Winstein 2004) examined strength training (summarised in Table 4). All employed muscle contraction resisted by exercise machines, weights, or elastic devices. Inaba 1973 and Kim 2001 limited the strength training to the affected lower limb, and Winstein 2004 to the upper limbs. The training met (Inaba 1973; Kim 2001) or was close to (Ouellette 2004) the ACSM 1998 criteria for strength training. All programmes were short (less than 12 weeks) apart from Ouellette 2004. In two of the four trials (96/158 participants) (Inaba 1973; Winstein 2004) the strength training commenced during usual care, with Winstein 2004 during the acute phase (less than one month post-stroke).

Table 4. Strength training interventions

Study	Mode	During/ after usual care	Upper/ lower body	Specific training	Intensity	Duration	Frequency	Programme length	ACSM criteria
Inaba 1973	Resistance training	During	Lower	No	50% and 100% maximum weight	UN	'Daily'	4 to 8	Yes
Winstein 2004	Resistance training; weights;	Both	Upper	No	UN	60	3 high 2 slow	4 to 6 (target of 20	UN

Table 4. Strength training interventions (*Continued*)

	Thera-band and grip devices							sessions)	
Kim 2001	Resistance training; isokinetic dynamometer	After	Lower	No	Maximal effort 3 x 10 repititions	30	3	6	Yes
Ouellette 2004	Resistance training; weights and pneumatic resistance machines	After	Lower	No	70% 1-RM 3 x 8 to 10 repititions	N/A	3	12	No (almost achieves criteria)

1-RM: one repetition maximum
UN: unknown

Mixed training

Nine trials (360/1147 partiicpants) (Dean 2000; Duncan 1998; Duncan 2003; James 2002; Mead 2007; Richards 1993; Richards 2004; Teixeira 1999; Yang 2006) examined mixed training (summarised in Table 5). Although Yang 2006 describe their intervention as 'resistance training', the durations of activity involved strongly indicate a cardiorespiratory contribution. Therefore, in this review, it is classified as mixed training and the effects of this assumption are tested using sensitivity analyses. The modes of exercise used for mixed training were quite diverse, with most being presented as circuit training. The lower limbs only were trained in six of the nine trials, and both the upper and lower body were trained in the remaining three trials. All interventions contained one or more functionally relevant activities (such as walking). Intensity of exercise was reported sufficiently to classify the cardiorespiratory component of two trials (James 2002; Teixeira 1999), and the strength component of three (Duncan 1998; Duncan 2003; Teixeira 1999) as meeting the ACSM 1998 criteria. In three of the nine trials (186/360 participants) the intervention programme was 12 weeks or more in length. The majority (7/9 trials) commenced after completion of usual care; only one (Richards 1993) commenced during the acute phase (less than one month post-stroke).

Table 5. Mixed training interventions

Study	Mode	During/ after usual care	Upper/ lower body	Specific training	Intensity	Duration	Frequency	Programme length	ACSM criteria
Richards 1993	Treadmill + Kinetron + tilt table	During	Lower	Yes	UN	104	5	5	UN

Table 5. Mixed training interventions (*Continued*)

Richards 2004	Treadmill + Kinetron + limb load monitor	During	Lower	Yes	UN	60	5	8	UN
Duncan 1998	Walking or cycle ergometry; elastic resisted contractions	After	Both	Yes	UN	90	3	12	cardio no, strength yes
Teixeira-Salmela 1999	Walking and stepping or cycle ergometry; resistance training body mass, weights and elastic	After	Lower	Yes	50% to 70% maximum work rate (CR) 50% to 80% 1-RM 3 x 10 repetitions (STR)	60 to 90	3	10	cardio yes, strength yes
Dean 2000	Walking and circuit training	After	Lower	Yes	UN	60	3	4	No
Duncan 2003	Circuit training	After	Lower	Yes	50% to 60% HRR	90 to 120	3	4	Cardio yes, strength UC
James 2002	Circuit training	After	Both	Yes	UN	90	3	12 to 14 (total of 36 sessions)	Cardio no, strength yes
Yang 2006	Functional stepping and chair rising	After	Lower	Yes	UN	30	3	4	No
Mead 2007	Circuit including walking, stepping, cycle ergometry; resistance training	After	Both	Yes	RPE 13 to 16	40 to 75	3	12 to 14 (total of 36 sessions)	UN

Table 5. Mixed training interventions (*Continued*)

	body mass, weights and elastic								

1-RM: one repetition maximum
CR: cardiorespiratory component
HRR: heart rate reserve
RPE: rating of perceived exertion
STR: strength component
UN: unknown

Adherence to training interventions

Adherence to the interventions was defined in terms of (1) attendance at planned training intervention sessions, and (2) compliance with the planned content of intervention sessions attended.

Attendance

Rate of attendance (%) could be determined in 13 of 24 trials. These ranged from 65% (Bateman 2001) up to 100% (Duncan 1998; Eich 2004; Mead 2007; Pohl 2002a; Pohl 2002b; Winstein 2004; Yang 2006). Four of the 13 studies reported attendance for the training and control groups separately and showed similar rates (Bateman 2001; Mead 2007; Ouellette 2004; Salbach 2004).
Mead 2007 allowed up to three additional 'catch-up' sessions to facilitate attainment of the intended dose of training (36 sessions). Teixeira 1999 also described attempts to make up missed sessions but did not report attendance. da Cunha 2002 excluded participants if they attended fewer than nine training sessions, thus preventing intention-to-treat analysis.

Compliance

Compliance with intended exercise during attended training sessions was described by six studies. For cardiorespiratory training interventions, Pohl 2002a and Pohl 2002b reported 'excellent tolerance' of treadmill training, and Salbach 2004 reported that participants usually completed 9/10 circuit training exercises. For mixed training Duncan 1998 reported 'good compliance' with home-based training and Yang 2006 stated that mixed circuit training was 'performed as planned'. Mead 2007 reported 94% to 99% compliance with circuit training exercises which were 'tailored', if required, to individual requirements. Data on compliance were not available for other trials.

Risk of bias in included studies

Randomisation

All included trials were described as randomised. The mechanisms of randomisation were reported in nine trials. These included physical methods such as picking cards (Dean 2000), or envelopes (Eich 2004; Pohl 2007; Yang 2006), or random number tables (da Cunha 2002), or computer-based methods (Bateman 2001; James 2002; Mead 2007; Salbach 2004).
The methods of randomisation were reported in 16 trials. To balance participant numbers matched pairs (Dean 2000) or block randomisation (Bateman 2001; Duncan 1998; Duncan 2003; James 2002; Katz-Leurer 2003; Richards 1993; Richards 2004; Salbach 2004; Teixeira 1999) were used.
To balance participant characteristics, allocations were stratified by walking performance (Pohl 2002a; Pohl 2002b; Salbach 2004), by age, sex, and time since stroke (Kim 2001), by disability (Richards 1993), stroke severity (Winstein 2004) or by age, sex, and disability using minimisation (Mead 2007).

Allocation concealment

Seven trials reported the use of sealed envelopes as a mechanism of allocation concealment (Bateman 2001; Duncan 2003; Eich 2004; James 2002; Pohl 2007; Winstein 2004; Yang 2006). Duncan 1998 used a third party to administer allocations. The computer-based allocation of participants in the Mead 2007 trial ensured allocation concealment.

Intention to treat (ITT)

There were 10 of 24 studies (691/1147 participants) that reported using ITT analyses (Bateman 2001; Duncan 1998; Duncan 2003; Eich 2004; James 2002; Mead 2007; Ouellette 2004; Pohl 2007; Potempa 1995; Richards 2004), although one of these (Bateman

2001) did not analyse data from some participants who dropped out. ITT analyses were permitted by imputation of missing data and recording outcome, where possible, in people who did not complete the interventions.
Seven of the remaining studies which did not report using ITT did not have any dropouts (Cuviello-Palmer 1988; Glasser 1986; Kim 2001; Pohl 2002b; Potempa 1995; Teixeira 1999; Yang 2006) thus retaining some of the benefits of ITT.

Blinding

Participant blinding

Participants could not be blinded to treatment. Two trials attempted to blind participants to the underlying hypothesis: Kim 2001 informed participants that they would receive one of two different leg-training interventions, while Mead 2007 informed participants that they would receive one of two different interventions, both of which may have (different) benefits.

Investigator blinding

In 15 of the 24 trials, blinding of outcome assessors was described (Bateman 2001; Dean 2000; Duncan 2003; Eich 2004; James 2002; Katz-Leurer 2003; Kim 2001; Mead 2007; Ouellette 2004; Pohl 2002a/Pohl 2002b; Pohl 2007; Richards 1993; Richards 2004; Salbach 2004; Yang 2006). In two of these, the authors indicate that some blinding might be compromised (Eich 2004; Salbach 2004), and in another (Dean 2000) the outcome assessor inadvertently observed the training group exercising, thus potentially identifying indirectly all participants of this small trial (12 participants). Participants were instructed not to reveal group assignments to those assessing outcome in three trials (Bateman 2001; Duncan 2003; Mead 2007). There was no outcome assessment blinding for any measure in the Winstein 2004 trial, and none for the secondary outcome measures (maximum gait speed, gait endurance (6-MWT), Rivermead Mobility Index and Motricity Index) in Pohl 2007. Detail of blinding is not known in the remaining seven of the 24 trials.

Losses to follow up

In all included trials, 29/579 participants (5%) in the training groups and 33/568 participants (6%) in the control groups were not available for assessment at the end of intervention. In the eight trials that included follow-up assessments (Bateman 2001; Eich 2004; Dean 2000; Duncan 1998; Katz-Leurer 2003; Mead 2007; Pohl 2007; Winstein 2004), 27/297 (9%) of those participants allocated training and 37/304 participants (12%) if the control group were not available for assessment at the end of the follow-up period. The proportion of losses was similar for the intervention and control groups at end of intervention (Chi^2 = 0.211; P = 0.646 NS) and the end of follow up (Chi^2 = 1.50; P = 0.221 NS).
Losses met or exceeded 20% at the end of intervention in Richards 2004 (15/63 participants; 24%) and Dean 2000 (3/12 participants; 25%), and at the end of follow up in Bateman 2001 (18/84 participants; 21%), Winstein 2004 (11/42 participants; 26%), Dean 2000 (4/12 participants; 33%), and Duncan 2003 (20/100 participants 20%).
da Cunha 2002 excluded participants (number unknown) with poor attendance, therefore ITT analyses were not possible.
A large proportion (101/177) of patients recruited to the three groups of the Inaba 1973 trial were lost both before and after randomisation. The distribution of total losses across the two included arms and one excluded arm of the trial remain unknown (total 88 participants). Data for 54/88 patients were analysed per protocol for the two included arms of the trial. One reason given for dropouts was discharge before the end of the study.

Selection bias

Recruitment in some trials involved media advertisement (Ouellette 2004; Teixeira 1999), and involved a database of volunteers (Dean 2000; Kim 2001; Yang 2006). This renders these studies susceptible to self-selection bias and thus affects the generalisability of their findings. All other studies recruited patients during stroke care.

Publication bias

Two outcome measures included in this review contained eight studies, sufficient to employ funnel plots as a means of investigating publication bias and other sources of heterogeneity (Analysis 1.9; Analysis 5.7).

Reliability of outcome measures

The disability, quality of life and mood scales reported in this review are commonly used in stroke trials and are known to be reliable in stroke patients. However, the Late Life Function and Disability Instrument (LLFD) (Ouellette 2004) has not been validated or reliability tested in people with stroke.
The reliability of the included secondary outcome measures have been established in people with stroke. This includes cardiorespiratory fitness (Potempa 1996), muscle strength (Eng 2002), muscle power (Dawes 2005), and indices of walking performance (Flansbjer 2005).

Types of study design

We identified six different types of study design; these have implications for establishing the effects of training interventions.

- Training plus per cent usual care versus usual care (8/24 trials).

- Training plus usual care versus non-exercise intervention plus usual care (1/24 trials).
- Training versus non-exercise intervention after usual care (6/24 trials).
- Training plus usual care versus usual care (4/24 trials).
- Training versus no intervention after usual care (3/24 trials).
- Training versus usual outpatient care (2/24 trials).

The first three designs incorporate a non-exercise 'attention control' or substitute an appropriate component of usual care with fitness training. This ensures that the total time spent exposed to the intervention is the same in both training and controls groups. These are the best controlled designs for establishing the effects of training interventions.

The second three designs (9/24 studies; 407/1147 participants) present problems for establishing effects of training interventions because the training groups have greater time exposed to interventions. In the case of rehabilitation interventions involving exercise, this has a known effect on rehabilitation outcomes ('Augmented Therapy Time') (Kwakkel 2004). These designs mean any treatment effects arising from physical fitness training interventions are confounded by increased 'contact time'; that is, time spent receiving an intervention. Sensitivity analyses were used to examine whether this source of confounding influenced estimates of effect for training interventions.

Effects of interventions

Effect of training on primary outcome measures

Case fatality

For all studies, only 1/1147 participants was reported to have died between baseline and end of intervention assessments (Pohl 2007) (1/77 control group). For the 9/24 studies (627/1147 participants) which included a retention follow up, 8/627 participants (1.3%) were reported to have died between end of intervention and end of follow up: Duncan 2003 (1/50 training, 2/50 control), Katz-Leurer 2003 (1/42 training, 1/39 control) and Pohl 2007 (1/77 training, 2/78 control). Death is an uncommon event.

Death or dependence

The composite outcome of death or dependence was not directly reported by any trial, and we could not determine it since no relevant dichotomised measures of dependence were reported.

Disability

Cardiorespiratory training

Few cardiorespiratory training data were suitable for meta-analysis (Analysis 1.1; Analysis 1.2; Analysis 1.3). Pooled FIM Instrument scores (Analysis 1.1) were not influenced by training after usual care (SMD (fixed), 95% CI 0.20, -0.17 to 0.58). Bateman 2001 report that the procedures for obtaining FIM data were not uniform and there is a high proportion of missing data items (38%) at end of intervention; however, the meta-analysis of the other studies (SMD (fixed), 95% CI 0.21 -0.10 to 0.52) is not influenced by their inclusion. Pooled Rivermead Mobility Index scores (Analysis 1.2) were not influenced by training provided during usual care (MD (random), 95% CI 1.25 -0.74 to 3.25). The Barthel Index data reported by Bateman 2001 are not pooled with Pohl 2007 because much of the data were either missing (17%) or reached ceiling values (27%). When available Barthel and FIM outcomes were combined (Analysis 1.3), there was a significant benefit (SMD (fixed) 0.45; 95% CI 0.21 to 0.70) but this was heavily influenced by a single study (Pohl 2007). In addition, heterogeneity is present and the result becomes non-significant when repeated with a random-effects model.

Individual study data at the end of intervention which could not be pooled (Table 1) showed a significant difference between the training and control groups in Barthel Index scores (Pohl 2007) analysed as both a continuous variable (MD (fixed), 13.6 95% CI 6.89 to 20.31) or dichotomised at a value of more than 75 (OR (fixed), 3.62 95% CI 1.84 to 7.10). There were no other significant effects reported for FIM locomotor scale (da Cunha 2002) and the Nottingham EADL (Bateman 2001) (14% missing values).

At the end of follow up (Analysis 2.1) there remained no between-group difference in Rivermead Mobility Index (MD (random), 95% CI 1.01 -1.39 to 3.41), but substantial heterogeneity and missing values (Bateman 2001) (21%) are evident. The Barthel Index data of Bateman 2001 had substantial missing data (24%) and ceiling values (38%); therefore we have not included these data in meta-analyses.

Among the individual study data at the end of follow up that could not be pooled (Table 6), Pohl 2007 showed a significant improvement in Barthel Index scores represented as a continuous variable (MD (fixed), 12.4 95% CI 4.32 to 20.48), but not a dichotomised one. There were no effects on the Frenchay Activities Index (Katz-Leurer 2003) or Nottingham EADL (Bateman 2001 (24% missing values)).

Table 6. Cardiorespiratory training: individual study data - end of retention follow up

Outcome	Measure	Study	Participants	Method	Effect Size	Significance
Disability	Nottingham EADL	Bateman 2001	64	MD (fixed), 95% CI	2.64 [-5.57, 10.85]	NS
Disability	Barthel index	Pohl 2007	155	MD (fixed), 95% CI	12.40 [4.32, 20.48]	P = 0.003
Disability	Frenchay Activities Index	Katz-Leurer 2003	79	MD (fixed), 95% CI	1.00 [-1.55, 3.55]	NS
Disability	Barthel Index > 75	Pohl 2007	155	OR (fixed), 95% CI	1.64 [0.87, 3.10]	NS
Physical fitness	Maximum cycling work (Watts)	Bateman 2001	66	MD (fixed), 95% CI	2.59 [1.69, 3.49]	P < 0.00001
Mobility	Functional Ambulation Categories	Pohl 2007	155	MD (fixed), 95% CI	1.20 [0.65, 1.75	P < 0.0001
Physical function	Berg Balance scale	Bateman 2001	66	MD (fixed), 95% CI	-2.90 [-7.88, 2.08]	NS
Physical function	Motricity index	Pohl 2007	155	MD (fixed), 95% CI	11.90 [3.63, 20.17	P = 0.005
Mood	Anxiety - HADS	Bateman 2001	53	MD (fixed), 95% CI	-1.60 [-3.58, 0.38]	NS
Mood	Depression - HADS	Bateman 2001	53	MD (fixed), 95% CI	-2.70 [-4.40, -1.00]	P = 0.002
Risk	Body mass (kg)	Bateman 2001	64	MD (fixed), 95% CI	2.81 [-4.63, 10.25]	NS

EADL: extended activities of daily living
HADS: Hospital anxiety and depression scale
NS: not significant

From among the pooled data and individual study data, only Pohl 2007 showed significant beneficial effects for the Rivermead Mobility Index and the Barthel Index at both end of intervention and end of follow up; the Rivermead scores were not investigator blinded and the study also reported a conflict of interest.

Strength training

Two studies reported effects of strength training on scale measures of disability (Ouellette 2004; Winstein 2004). No data could be pooled (Comparison 4) and all individual effect sizes (Table 7) were non-significant at the end of intervention. Only Winstein

2004 included follow-up data: this was of borderline significance (Table 8).

Table 7. Strength training: individual study data - end of intervention

Outcome	Measure	Study	Participants	Method	Effect Size	Significance
Disability	LLFDI (frequency dimension)	Ouellette 2004	41	MD (fixed), 95% CI	0.10 [-4.65, 4.85]	NS
Disability	LLFDI (limitation dimension)	Ouellette 2004	41	MD (fixed), 95% CI	1.30 [-5.02, 7.62]	NS
Disability	FIM Mobility	Winstein 2004	40	MD (fixed), 95% CI	0.90 [-3.66, 5.46]	NS
Disability	FIM Self-care	Winstein 2004	40	MD (fixed), 95% CI	-0.85 [-4.26, 2.56]	NS
Disability	Improvement in 10 ADL	Inaba 1973	54	OR (fixed), 95% CI	2.88 [0.95,8.70]	NS
Physical function	Timed up and go (seconds)	Yang 2006	48	MD (fixed), 95% CI	-1.50 [-5.23, 2.23]	NS
Health and QoL	SF-36 Physical Health	Kim 2001	20	MD (fixed), 95% CI	1.47 [-4.24, 7.18]	NS
Health and QoL	SF-36 Mental Health	Kim 2001	20	MD (fixed), 95% CI	2.80 [-4.95, 10.55]	NS

FIM: Functional Independence Measure
LLFDI: late life function and disability
NS: not significant
QoL: quality of life
SF-36: Short Form 36 questionnaire

Table 8. Strength training: individual study data - end of retention follow up

Outcome	Measure	Study	Participants	Method	Effect size	Significance
Disability	FIM Mobility	Winstein 2004	31	MD (fixed), 95% CI	-3.23 [-6.14, -3.32]	P = 0.03
Disability	FIM Self-care	Winstein 2004	31	MD (fixed), 95% CI	-3.32 [-6.48, -0.16]	P = 0.04

FIM: Functional Independence Measure

Inaba 1973 reported the proportion of patients that improved performance of 10 activities of daily living (no scale reported). Although noted as significant in the publication, the odds ratio of this effect was borderline (OR (fixed) 2.88; 95% CI 0.95 to 8.70); P = 0.06). Inaba 1973 states that little additional improvement occurred during a further month of training, although these data were not available.

Some data may be weakened due to high patient attrition plus no ITT analyses reported (Inaba 1973; Winstein 2004), and use of a disability scale not validated in people with stroke (late life function and disability: LLFDI) (Ouellette 2004).

Mixed training

Five studies report the effects of mixed training on scale measures of disability (Duncan 1998; Duncan 2003; Mead 2007; Richards 1993; Richards 2004). Meta-analyses were performed at the end of intervention for the Lawton IADL (Analysis 5.1), the Barthel Index (Analysis 5.2), and its ambulation subscore (Analysis 5.3) and the Barthel and FIM scores in combination (Analysis 5.4). There were no significant effects at the end of intervention, or end of follow up (Analysis 5.6). In these meta-analyses, two trials (Duncan 1998; Duncan 2003) were confounded by increased training time and individual patient data for one of them (Duncan 1998) shows Barthel Index scores reaching a ceiling of 100 in 5/20 participants at baseline and 10/20 at follow up.

Several other individual disability outcomes that could not be pooled in meta-analyses were reported. None showed a significant effect of mixed training at either the end of intervention (Table 9) or end of follow up (Table 2).

Table 9. Mixed training: individual study data - end of intervention

Outcome	Measure	Study	Participants	Method	Effect size	Significance
Disability	FIM Instrument	Mead 2007	66	MD (fixed), 95% CI	-0.10 [-1.70, 1.50]	NS
Disability	Nottingham EADL	Mead 2007	66	MD (fixed), 95% CI	-0.20 [-1.08, 0.68]	NS
Disability	Rivermead Motor Index	Mead 2007	66	MD (fixed), 95% CI	-0.41 [-6.14, 0.81	NS
Disability	FIM motor subscale	Duncan 2003	93	MD (fixed), 95% CI	2.60 [-0.29, 5.49]	NS
Disability	FIM cognitive subscale	Duncan 2003	93	MD (fixed), 95% CI	0.10 [-0.37, 0.57]	NS
Physical fitness	VO_2peak	Duncan 2003	100	MD (fixed), 95% CI	0.99 [0.35, 1.63]	P = 0.002
Physical fitness	Net gait economy ml/kg/10 metre	Mead 2007	65	MD (fixed), 95% CI	-0.14 [-0.27, -0.01]	P = 0.03
Physical fitness	Strength, handgrip	Duncan 2003	100	MD (fixed), 95% CI	0.32 [-1.85, 2.49]	NS
Physical fitness	Power, LLEP, affected (W/kg)	Mead 2007	65	MD (fixed), 95% CI	0.07 [-0.07, 0.21]	NS
Physical function	Adjusted Activity Score	Teixeira 1999	13	MD (fixed), 95% CI	13.79 [2.11, 25.47]	P = 0.02
Health and QoL	Nottingham Health Profile	Teixeira 1999	13	MD (fixed), 95% CI	-8.97 [-12.84, -5.10]	P = 0.00001

Table 9. Mixed training: individual study data - end of intervention (*Continued*)

Mood	Anxiety (HADS)	Mead 2007	66	MD (fixed), 95% CI	-0.34 [-1.84, 1.16]	NS
Mood	Depression (HADS)	Mead 2007	66	MD (fixed), 95% CI	0.54 [-0.93, 2.01]	NS

EADL: extended activities of daily living
FIM: Functional Independence Measure
HADS: Hospital anxiety and depression scale
LLEP: Lower limb extensor power
NS: not significant
QoL: quality of life

Effect of training on secondary outcomes

Adverse effects

Adverse events were not reported systematically for all trials. However in 10/24 trials (461/1147 (40%) participants), the authors did comment on the tolerance to the training and there were no adverse reactions or events such as falls, fractures, or injuries arising during the intervention. Mead 2007 reported 11 falls in 8/32 patients in the exercise group and five falls in 4/34 patients in the control group (NS); none occurred during the interventions.

For all studies, 3/1147 (0.3%), participants were reported to have had a cerebrovascular event between baseline and end of intervention assessments. In 9/24 studies (627/1147 participants) which included a follow up, 6/627 (1.0%) participants were reported to have had a stroke between end of intervention and end of follow up.

For all studies, 6/1147 (0.5%) participants were reported to have had a cardiovascular event between baseline and end of intervention assessments; none (0/627) were reported between end of intervention and end of follow up.

Few data regarding modification of risk factors for cardiovascular and cerebrovascular events were available. Three studies (144 participants) reported blood pressure at the end of cardiorespiratory training (Comparison 1; da Cunha 2002; Katz-Leurer 2003; Potempa 1995). There was no significant effect on systolic (Analysis 1.4, MD (random) -3.46 mmHg 95%CI -9.57 to 2.64) or diastolic measures (Analysis 1.5, MD (fixed) -0.23 mmHg 95%CI -3.33 to 2.87).

Physical fitness

Cardiorespiratory training

Pooled data from cardiorespiratory training trials (Comparison 1) show a significant difference between training and control groups in the VO_2peak (Analysis 1.6, MD 3.5 mlkg-1min-1, 95% CI 1.52 to 5.52; P < 0.0001), and the maximal cycling work rate (Analysis 1.7, SMD (random) 0.60, 95% CI 0.18 to 1.02) at the end of intervention. The Bateman 2001 work rate data were transformed to a normal distribution (Log_e) data with 8% missing values. da Cunha 2002 assessed the gross economy of gait and reported a moderate (0.7 SD units) but non-significant effect size; however profound variability in baseline measures and small sample size limit the contribution of this study.

Strength training

Two studies examine the effects of strength training (Comparison 3) on muscle strength (Kim 2001; Winstein 2004), providing data that can be pooled in a meta-analysis. Kim 2001 examined the effect of strength training of the involved lower limb on a composite measure of strength of the involved lower limb (sum of the percentage change in six muscle groups). Winstein 2004 examined strength training of the upper limbs on a composite measure of upper limb strength (sum of the torque of the extensors and flexors of the wrist, elbow and shoulder). The pooled effect size (Analysis 3.1) was marginally significant (SMD (fixed) 0.58, 95% CI 0.06 to 1.10). Included trials report change scores, but the composite measures of strength do not have a common unit of measurement, therefore SMD is used. However the larger individual effect (Winstein 2004) is biased by two interacting factors, unblinded assessment and use of a dynamometer which is hand held by the

investigator; these data are also confounded by increased training time.

Ouellette 2004 examined strength bilaterally in the lower limb extensors, and unilaterally in the knee extensors and the ankle flexors (plantar and dorsi). All strength measures were reported to significantly improve after resistance training compared with the control group, except for ankle dorsiflexion on the unaffected side. This study also suggested peak power is improved during unilateral knee extensions, but not during bilateral extension of the whole lower limb. However strength and power data are limited to graphs and cannot be satisfactorily interpolated for further analysis.

Inaba 1973 reported that patients allocated strength training of the involved lower limb made significantly greater gains in the 10 repetition maximum compared with controls (12.18 versus 8.58 kg, $P < 0.02$) after one month of intervention. There were no differences between groups after two months of training. No measures of variance were included with these data.

Mixed training

Individual mixed training data which could not be pooled show small significant differences in VO_2peak (Duncan 2003) and net economy of gait (Mead 2007) at the end of intervention (Table 9), although the benefit in economy disappeared after a three-month follow up (Table 2). Bateman 2001 reported significant retention of maximum cycling workload at a three-month follow up (Table 2); however there are many missing values (21%).

Meta-analysis of the Duncan 2003 and Yang 2006 trials showed no effects of mixed training (Comparison 5) on ankle dorsiflexion strength (Analysis 5.5) or knee extension strength (Analysis 5.6). This meta-analysis is problematic due to substantial heterogeneity and both studies being confounded for increased training time. The Duncan 2003 data are reported as change scores in torque (Nm; leg unknown), and Yang 2006 report change scores in force (kg), therefore we used SMD. The Yang 2006 paper reports a range of other lower limb strength improvements, but all measures were made using a hand-held dynamometer, which is vulnerable to bias. Assuming Yang 2006 to be classified as strength training instead (sensitivity analysis), only the data of Duncan 2003 would remain along with no significant effects.

Individual mixed training trials (Table 9; Table 2) show no evidence of immediate or retained effect on explosive power of the lower limb (Mead 2007) or an immediate effect on handgrip strength (Duncan 2003).

Mobility

Cardiorespiratory training

Meta-analyses of the effects of cardiorespiratory training were possible at the end of intervention (Comparison 1) and the end of follow up (Comparison 2). These data show that treadmill training interventions during usual care led to significantly lower Functional Ambulation Category (FAC) scores at the end of intervention (Analysis 1.8, MD (fixed), 0.72 95% CI 0.46 to 0.98); only one study (Pohl 2007) followed up FAC (Table 6) and showed significant retention (MD (fixed), 1.20 95% CI 0.65 to 1.75).

A range of cardiorespiratory training interventions led to improvements in gait performance assessed by maximal gait speed (Analysis 1.9, MD (fixed), 6.47 m/min 95% CI 2.37 to 10.57), preferred gait speed (Analysis 1.10, MD (fixed), 5.15 m/min 95% CI 2.05 to 8.25) and gait endurance (Analysis 1.11 and Analysis 1.12, MD (fixed), 38.9 metres 95% CI 14.3 to 63.5) at the end of intervention. Most data were available for interventions during usual care; however, the direction and magnitudes of the effects appeared similar after usual care.

Fewer data were available regarding the retention of mobility benefits (Comparison 2). There is no effect on maximal gait speed after follow up (Analysis 2.2, MD (random), 6.95 mmin-1 95% CI -0.79 to 14.70). However, if the Bateman 2001 data based on cycle ergometry are excluded, then the remaining gait-specific treadmill subgroup (Eich 2004; Pohl 2007) were homogenous and showed significant retention of maximum gait speed (Analysis 2.3, MD (fixed) 10.6 mmin-1 95% CI 4.91 to 16.29) and gait endurance at follow up (Analysis 2.4, MD (fixed) 57.51 metres 95% CI 25.82 to 89.19). Eich 2004 reported continued improvement in these outcomes during the follow-up period.

Apart from one trial (Katz-Leurer 2003), none of the studies examining gait outcomes is confounded by additional training time. In fact, the time spent receiving the training interventions in Pohl 2002a and Pohl 2002b was less than the control group. Interventions were wholly or partly walking-specific apart from one that used a Kinetron device (Glasser 1986), and two that used cycle ergometry (Bateman 2001; Katz-Leurer 2003).

Subgroup analysis indicated that two studies which met the ACSM 1998 criteria for cardiorespiratory training had no effect on maximum gait speed (Analysis 1.10), whilst those which did not (or were unknown) had a significant effect. One plausible reason may be due to the Bateman 2001 intervention not being specific to gait outcomes.

A funnel plot of the eight studies in Comparison 1, Outcome 9 (Analysis 1.9) showed a tendency toward asymmetry, suggesting that there may be some heterogeneity which may arise from publication bias; however, there are too few data points to explore this further.

Strength *t*raining

Strength training (Comparison 3) showed no significant benefits for maximal gait speed (Analysis 3.2, MD (fixed) -1.17 mmin $^{-1}$ 95% CI -5.53 to 3.19) or preferred gait speed (Analysis 3.3, MD (fixed) -2.16 mmin^{-1} 95% CI -7.73 to 2.51). There was no training content in the strength training studies specific to the

performance of walking.

We performed a sensitivity analysis by including the Yang 2006 data categorised as strength training instead of mixed training (Analysis 3.2). This introduced heterogeneity and the pooled effect of strength training on preferred gait speed remained not significant (MD (random) 2.37 $mmin^{-1}$ 95% CI -6.80 to 11.53). Inclusion of Yang 2006 as a strength training trial allowed pooling with the Ouellette 2004 data, but there was no effect on gait endurance (Analysis 3.4, MD (fixed) 39.3 metres 95% CI -8.20 to 86.85).

Mixed training

Meta-analysis of eight studies (332 participants) reporting the effects of mixed training on preferred gait speed at the end of intervention (Comparison 5) showed no improvement (Analysis 5.7, MD (random) 2.58 $mmin^{-1}$ 95% CI -0.33 to 5.5). A funnel plot of these data was symmetrical and did not show any indication of heterogeneity which might arise from publication bias. Subgroup analysis showed a borderline (P = 0.06) effect in the 5/8 studies confounded for additional training time (Analysis 5.8, MD (random) 4.43 $mmin^{-1}$ 95% CI -0.13 to 8.99). One study (Richards 1993) showed an indication of dose-response where the improvement in preferred gait speed was positively associated with the amount of time spent on the gait training component (R^2 = 0.63). There was a small significant effect of mixed training on gait endurance (Analysis 5.9, MD (fixed) 30.04 metres 95% CI 8.49 to 51.6). However, 3/4 included studies, the majority of the data (168/177 participants), are confounded for contact time. This leaves only one small study (Dean 2000) for which assessment of this outcome was not blinded, and which showed no effect of mixed training at the end of intervention or the end of follow up. Three studies examined retention of benefits in preferred gait speed but no benefits were observed at follow up (Analysis 6.2).

Comparison of cardiorespiratory and mixed training (Comparison 7)

There were sufficient cardiorespiratory and mixed training trials assessing preferred gait speed to perform a meaningful subgroup analysis to compare the effects of the two training types. Meta-analyses suggest that the effect of cardiorespiratory training is greater than mixed training (5.15 versus 2.58 $mmin^{-1}$; Analysis 7.1). If this is repeated without studies confounded for additional training time, the difference is increased further (6.98 versus -0.25 $mmin^{-1}$; Analysis 7.2).

Physical function

Meta-analysis was possible for scored indices of physical and motor function (Fugl-Meyer scores, Berg Balance scale), and measures of performance of specific physical functions (functional reach, timed up-and-go, stair climbing). Apart from Berg Balance after cardiorespiratory training (Analysis 1.14; not significant) and stair climbing speed after strength training (Analysis 3.5; not significant) most data related to mixed training.

Meta-analyses showed no significant overall effect after mixed training (Comparison 5) on Fugl-Meyer upper-extremity scores (Analysis 5.10), Fugl-Meyer lower extremity (Analysis 5.11), Berg Balance scores (Analysis 5.12) or functional reach (Analysis 5.13). Timed three-metre up-and-go performance was significantly faster by a small margin (Analysis 5.14, MD (fixed), -1.14 sec 95% CI -2.06 to -0.22) at the end of mixed training. However, the data of Yang 2006 were confounded for additional training time; if excluded the effect was no longer significant (Analysis 5.15, MD (fixed) -1.16 sec 95% CI -2.93 to 0.62). At follow up, there was no significant retention of benefit in timed three-metre up-and-go performance (Analysis 6.3).

Individual study data which could not be pooled showed little evidence of benefit (Table 1 to Table 2). Pohl 2007 showed improvement in the Motricity Index (physical function of upper and lower extremities) at the end of cardiorespiratory training intervention and the end of follow up; however, there was no blinded assessment of this outcome measure, plus there is a competing interest present. The Adjusted Activity Score data reported by Teixeira 1999 improved, but this was a very small study (13 participants).

Health status and quality of life

No data exist examining the role of cardiorespiratory training on health status and quality of life.

For strength training only one small study (Kim 2001) (20 participants) reported mean change in SF-36 domains of 'Physical Health' and 'Mental Health'; there were no effects at the end of intervention (Table 7).

Three mixed training studies reported SF-36 domains (Duncan 2003; James 2002; Mead 2007) which could be pooled at the end of intervention (Analysis 5.16, Analysis 5.17; Analysis 5.18) and end of follow up (Analysis 6.4; Analysis 6.5). However, James 2002 and Duncan 2003 are confounded for additional training time. The remaining unconfounded study (Mead 2007) showed a significant improvement in SF-36 'Role Physical' after intervention which was retained after a four-month follow up. James 2002 reports an older version of the SF-36, therefore SMD were calculated.

Mood

Two studies examined the effect of cardiorespiratory training (Bateman 2001: Table 1; Table 6) and mixed training (Mead 2007: Table 9; Table 2) on mood. Neither showed any immediate or retained effects on the anxiety and depression components of Hospital Anxiety and Depression Scale (HADS). The Bateman 2001 data had substantial missing values at end of intervention (29%) and end of follow up (37%).

DISCUSSION

The outcome measures from the included trials were very diverse. This has been typical of stroke rehabilitation trials for some time (Greener 2002) and continues to present a problem when combining data in systematic reviews.

Effect of training on primary outcome measures

Case fatality

It is not known whether physical fitness training reduces case fatality. The observed numbers of deaths in this review may be low because participants included were at lower risk of death compared with the wider stroke population. This may occur firstly because the inclusion criteria of the trials of exercise select participants with milder strokes (most were ambulatory) and reduced risk factors (such as blood pressure ceiling criteria). Secondly, there may be self-selection by participants who are physically active with increased fitness. Higher physical activity is known to be associated with reduced risk of stroke (Lee 2003; Wendel-Vos 2004) and higher VO_2peak is associated with reduced risk of stroke (Kurl 2003) and mortality (Lee 2002).

In addition, the majority of the training programmes in this review are all very short duration (12 weeks or less). A Cochrane Review of the effect of exercise-only interventions showed that exercise reduced deaths in people with coronary heart disease (Jolliffe 2002) but the training programmes often lasted several years. Since many stroke patients have co-existing heart disease, training might influence post-stroke mortality provided it comprised cardiorespiratory training delivered over long periods of time. This requires investigation.

Death or dependence

There are no data available to draw conclusions about the influence of training on the composite outcome of death or dependence after stroke. Death is infrequent, and measures of dependency such as those based on simple questions, Barthel Index score of less than 20 or modified Rankin Scale score of 3, 4 or 5 are lacking (Lindley 1994). Both elements of this composite outcome are likely to be rare in those eligible for physical fitness training.

Disability

We assessed a number of different global indices of disability, including subscales. Limited data were suitable for meta-analysis and there was no good evidence of either an immediate or retained effect of fitness training on disability. There may be several reasons for this. Firstly, we identified a number of methodological issues which weaken and bias these limited data. Secondly, some measurement tools lacked sensitivity due to the recruitment of patients typically presenting with milder strokes. There was evidence of ceiling effects in the Barthel Index data from two trials (Bateman 2001; Duncan 1998), and the FIM Instrument is also known to show ceiling effects, particularly in community living patients (Hall 1996). Thirdly, a lack of effect on disability measures despite functional benefits has been reported in trials of exercise for healthy elderly people (Keysor 2001).

The lack of an immediate effect, however, does not preclude longer-term benefits. An increased fitness reserve may ameliorate the deterioration of function which will occur with increasing age and thus postpone crossing thresholds of independence (Young 2001). Therefore, indicators of pre-clinical disability (Fried 1996) coupled with long-term follow up may be a more useful approach for assessing outcome in trials of fitness training after stroke.

There were insufficient data to investigate any secondary objectives or to perform any subgroup analyses on the primary outcome measures. Few conclusions can be drawn about the impact of physical fitness training on death, dependence, or disability after stroke.

Effect of training on secondary outcome measures

Adverse events

There was no evidence of adverse events arising from training in patients who met the criteria for participation in physical fitness training. However, this may not be generalisable to the wider stroke population, and few trials specifically intended recording adverse events. There is a need to improve the recording of adverse events in trials.

Physical fitness

Cardiorespiratory fitness

VO_2peak measured at baseline in three trials (da Cunha 2002; Duncan 1998; Potempa 1995) was 25%, 50% and 55% of values expected in untrained age- and sex-matched healthy people (Shvartz 1990). Mixed training, and in particular cardiorespiratory training, significantly improved VO_2peak, and improved exercise tolerance during continuous exercise. This may be beneficial because low VO_2peak is associated with functional limitation in elderly people (Young 2001). In people with stroke, the functional benefits are less clear (e.g. contradictory data of Patterson 2007 and Michael 2007); however, low VO_2peak is linked to increased risk of stroke (Kurl 2003) and stroke mortality (Lee 2002).

Economy of walking may improve in response to training which contains walking activity. However, one of the two studies had a

small sample size and variable baseline data, making interpretation difficult. A limited 'fitness reserve' caused by low VO_2peak coupled with poor walking economy is a common post-stroke problem (Macko 2001). Therefore, training to improve walking economy and increase peak may be beneficial for walking performance and exercise tolerance after stroke. There are too few data to examine the post-training retention of cardiorespiratory fitness.

Muscle strength

There are limited data to quantify whether mixed training or strength training improves muscle strength after stroke. Analyses showing improvements are all associated with studies which are either confounded for training time or biased. There are no data to examine the post-training retention of strength.

Mead 2007 measured explosive lower limb extensor power but showed no immediate or retained effect of mixed training. Non-response could be due to a lack of explosive, fast movements during resistance training. In people with stroke, explosive power is associated with function and disability after stroke (Saunders 2008), and in elderly people explosive power output may be more important than strength for function and disability (Puthoff 2007). Interventions to improve explosive power after stroke remain under-researched (Evans 2000).

Mobility

There is consistent evidence that cardiorespiratory training which involves walking can benefit walking ability when provided during inpatient stroke care. This intervention reduces dependence on other people for ambulation, increases walking speed and improves tolerance of continuous walking. Firstly, improvement may occur due to an increased fitness reserve (arising from increased VO_2peak or improved economy of walking, or both). Secondly, cardiorespiratory walking training is both task-related and repetitive in nature; these factors may facilitate motor learning and benefit gait performance even in the absence physical fitness improvments.

There is no evidence that strength training benefits walking. None of the interventions incorporated walking as a mode of exercise, and are therefore not specific. In addition, improvements in strength may not necessarily produce functional benefits (Kim 2001) and this may be due to complex relationships between fitness and function which may arise from factors such as non-linear associations (Buchner 1991) and the interaction of 'co-impairments' such as balance and low muscle strength (Rantanen 2001). Evidence examining the effect of mixed training on walking performance is problematic since the majority of studies are confounded by increased training time. There is no effect of mixed training on gait outcomes in the unconfounded studies. All studies except one (Yang 2006) include an element of walking; therefore, benefits may be due to the additional volume of time spent walking along with any other potential 'attention' effects. Two studies (205 participants) hint that some gait benefits persist after training finishes, but one (Pohl 2007) has some methodological issues and a high drop-out rate at follow up.

Physical function

There is no good evidence that training in any form improves a whole spectrum of functional limitations. The limited pooled data which suggests a small effect of mixed training after usual care on balance and lower extremity function are confounded by increased training time. Any promising effects reported by individual studies are similarly compromised through bias and confounding. Studies free of these problems are associated with no effect.

Health status and quality of life

Little is known about whether training can improve self-perceived health status and quality of life after stroke. Health status and quality of life are reported by one small study of strength training and not at all by those investigating cardiorespiratory training. Two of the three mixed training studies reporting SF-36 are confounded for increased training time. The SF-36 'role physical' domain shows both immediate and persistent benefits, but the scoring of this domain is problematic in those who are not engaged in employment (Johnson 1999). In addition, various elements of the SF-36 are prone to ceiling effects in these studies (Hobart 2002).

Mood

There were too few data to examine the effects of training on mood.

Factors influencing primary and secondary outcome measures

Dose of training

All the training interventions occurred regularly and were progressive in nature. The interventions differed in the dose of training quantified in terms of (1) overall volume of training time, and (2) the intensity of the exercise used.

The ACSM 1998 criteria were used to define an effective overall 'dose' of fitness training as defined by the parameters of intensity, duration, and frequency. One of the few intended subgroup analyses which explored this showed benefit was not clearly linked to those studies which met the criteria. This illustrates the problem of performing meaningful analyses from the subgrouping of small numbers of trials: the consequences are reduced power and the influence of characteristics unrelated to the grouping factors, in this case the potentially powerful effect of specificity of training.

Some study interventions may have provided a sufficient dose of training, but failure to record or report intensity meant they could not be assigned to a category. Conversely, interventions meeting the criteria may have provided a low dose of training because they were of short duration (e.g. Kwakkel 2004).

Underestimation of benefits may arise if interventions are poorly attended or complied with. Full attendance was reported in six trials. This may have been facilitated because the interventions either occurred partly or completely during inpatient care, or were home-based or of very short duration (four weeks).

Overestimation of benefits may arise in interventions confounded by increased training time: exaggeration would be greatest in studies with the biggest training volumes. In seven of the nine confounded studies, 20 hours or more training was used, whilst only two of the 15 unconfounded studies exceeded 20 hours' training. Meta-analysis has shown that when stroke rehabilitation is augmented with an additional 16 hours' exercise therapy, there are benefits in activities of daily living (Kwakkel 2004). This may explain why significant training effects are more frequently associated with the studies confounded by increased training time. However, this is still problematic since the greater benefits may arise from greater training volumes. The data of Richards 1993 support these observations, showing that time spent gait training was associated with mobility outcomes - this also may be indicative of a dose-response relationship.

Exercise intensity is probably one of the most important fitness training variables. Only the interventions of Pohl 2002a and Pohl 2002b examined this directly and showed that the higher intensity walking intervention (Pohl 2002b) was more beneficial for maximal walking speed than lower intensity walking (Pohl 2002a). However, this intervention was also the most rapidly progressing, so this effect is difficult to separate the effect from that of intensity. This review indicates stroke patients can participate in and complete a variety of different short-term training interventions, but the optimal dose of training for people with stroke is difficult to establish from these data.

Type of training

No included studies directly compare cardiorespiratory, strength, and mixed training. In this review it was only feasible to compare the effect of cardiorespiratory training and mixed training on one shared outcome: preferred gait speed. It is difficult to draw conclusions from the greater benefit associated with cardiorespiratory training, since the cardiorespiratory training interventions comprised a greater amount of gait-related training and the effect could therefore be one of specificity of training rather than the type of training.

The review does show that adaptations and benefits are linked to the specificity of the training response, as follows.

1. Cardiorespiratory fitness (VO_2peak) improved after cardiorespiratory training (Analysis 1.6).
2. Muscle strength improved after strength training (Analysis 3.1).
3. Walking performance improved after training interventions employing walking or walking-like modes of exercise (Analysis 1.10).
4. Walking performance did not improve after an intervention based on cycling (Bateman 2001, Analysis 1.10) even though this did improve cardiorespiratory fitness.
5. Walking and physical function outcomes did not improve after strength training interventions probably because functionally relevant movements are difficult to incorporate into strength training interventions.
6. Muscle explosive power output did not improve after an intervention which lacked explosive movements (Mead 2007).

There were too few data to determine the relative effects training the upper versus lower limbs, or the affected versus unaffected limbs. In summary, it is not known which type of training, if any, is most beneficial. However, the findings support the concept of training specificity.

Timing of training

Although some important findings of this review are based on interventions performed during usual care, there were too few data to compare interventions during usual care versus after usual care.

Retention of benefits

Eight of the 24 studies incorporated follow-up data. Some benefits observed at the end of intervention remained at the end of follow up. These included maximum cycling workload (Bateman 2001), Functional Ambulation Categories and Motricity Index (Pohl 2007), maximum gait speed and gait endurance (Eich 2004; Pohl 2007), and SF-36 'Role Physical' (Duncan 2003; Mead 2007). These observations should be viewed with caution because of unblinded assessments (Pohl 2007), high participant attrition (greater than 20% in Bateman 2001; Duncan 2003; Pohl 2007) and measurement validity issues (SF-36 'Role Physical').

The only significant benefit to emerge after follow up that was not previously present at the end of intervention was SF-36 'Social Function' but this is based on only one study (Duncan 2003).

Functional advantages observed at the end of rehabilitation interventions are known to be transient, disappearing at a later stage (Kwakkel 1999; Kwakkel 2002). This is probably due to continued improvements in the control group rather than deterioration in function (Langhorne 2002). However, fitness improvements observed at the end of training interventions are known to deteriorate. An immediate improvement in economy of walking disappeared at the end of follow up (Mead 2007), but other cardiorespiratory and strength follow-up data are lacking. There are limited data examining retention of benefits as a whole, and no clear pattern of retention emerges.

In summary, functional benefits mediated by increased physical fitness may not be sustained unless some form of training stimulus is maintained. At present there are no data examining long-term fitness training, or facilitation of continued exercise after the end of fitness training. Long-term follow up should be incorporated into future trials of physical fitness training.

Effect of initial patient status on outcome measures

Two studies dichotomised their participants on measures of stroke severity and showed those with lower severity benefited most from training in terms of Fugl-Meyer scores at the end of training (Winstein 2004) and the Frenchay Activities Index scores at the end of follow up (Katz-Leurer 2003). However, this type of subgrouping reduces statistical power and there are methodological issues associated with both of these studies. Other than this, there were too few suitable data to determine the effects of disability, ambulatory status, or degree of hemiparesis using meta-analyses. Nothing can be concluded about initial patient status.

Effect of physical activity performed by control groups

Training effects arising from physical activity in the control group interventions could explain the frequent lack of effect in some of the higher quality studies. However, a strength of this review is the inclusion criteria, which ensure that control group interventions other than usual care were restricted to being passive or being unlikely to provide a benefit which could influence outcome measures.

Effect of trial quality

There are insufficient data to examine the effects of trial quality on outcome measures. However, five of the 24 studies reported outcome assessments unblinded from the outset or were subject to subsequent inadvertent unblinding. This inadvertent unblinding may have happened in other studies, but was not reported. Unblinded outcome assessment risks biasing the data of 350 of the 1147 participants (31%).

Summary of findings

- Most available data relate to ambulatory people in the chronic phase (less than one month) post stroke.
- It is feasible for stroke patients to participate in a variety of short-term fitness training regimens presented in a range of settings either during usual stroke care or after discharge.
- There is nothing to suggest that adverse events arise from participation in fitness training.
- Little is known about the effect of any form of training on the primary outcomes of death and dependence.
- Few studies reported global indices of disability; no meta-analyses showed effects on measures of disability.
- There is some evidence that cardiorespiratory fitness can be improved via training containing some cardiorespiratory training content.
- There is good evidence that cardiorespiratory training during usual care, which involves walking as a mode of exercise, can reduce dependence on others during ambulation and improve walking performance in terms of speed (maximum speed +9.85 $mmin^{-1}$; preferred speed +5.85 $mmin^{-1}$) and the distance walked in six minutes (+38.9 m).
- Few strength training data exist. Some studies hint at an improvement in muscle strength, but there is no other evidence of benefit from the studies, either individually or collectively.
- The majority (six out of nine) of mixed training interventions are confounded for training time; without these there is no clear evidence of any benefits. Currently little can be safely concluded about mixed training interventions.
- There are very few outcome data relating to physical function, health status and quality of life, and mood.
- It was not possible to determine the effect of fitness training variables, such as 'dose' or type of training, on outcome measures.
- A consistent pattern of findings supports the idea that benefits may be greater when fitness training is specific or 'task-related'.
- No conclusions can be drawn about retention or loss of benefits after training is completed.
- There were methodological problems and study design issues which bias and confound much of the available data, and affect its generalisability.

Issues for research

Control groups

In terms of trial designs, there should be a concerted effort to balance total contact time across all arms of trials to avoid confounded results. Whatever control exposure is chosen to balance time spent training should contain minimal or preferably no physical activity, since even performing activities of daily living may be sufficient to cause training effects in elderly people (Young 2001). One robust way of clarifying whether the content of the training itself is beneficial would be comparison of two doses of training (e.g. Pohl 2002b); this has not been repeated.

Intervention

In people with stroke, muscle strength and power are more clearly associated with functional advantages than cardiorespiratory fitness, yet well controlled studies containing interventions to improve muscle force production are lacking. In addition, resistance

training often involves exercise modes in which the movements performed in training bear little resemblance to those relevant to everyday life: although strength may improve, no functional benefit arises. The nature of the associations between physical fitness and functional benefit are complex, and this suggests that training interventions should be more complex and address other co-impairments such as balance.

Outcome measures

Currently used measures of disability and dependence are problematic, since stroke patients who are eligible for fitness training have typically mild disability. This is difficult to detect (as many disability measures have ceiling effects), yet it may be a precursor to the later onset of disability arising from functional decline. Therefore, an appropriate way of assessing long-term outcome in this group of stroke patients may be measures of pre-clinical disability (e.g. Fried 1996).

Long-term studies

Improvements in physical fitness after training, and improvements in physical function after rehabilitation are transient. Since physical fitness may be linked to functional status, the long-term retention of benefit should be examined routinely in training studies. Fitness and function deteriorate with increasing age in everybody, and this is exacerbated by physical inactivity. Therefore, it is plausible that short-term effects of training only emerge as being beneficial after a period of functional decline.

Related to this is the need to examine strategies aimed at promoting physical activity and maintaining physical fitness in the long term after stroke. This has not been investigated.

In general terms, there remains a general need for more, larger trials of functionally relevant physical fitness training that should include participants with a greater range of stroke severity, including non-ambulatory patients.

Ongoing studies

Some of the issues for research will be addressed by ongoing or completing studies (Characteristics of ongoing studies); for example, more strength training (Eng; Patten; Pomeroy) and power training (Kilbreath) data will emerge. However, key issues remain unaddressed; most ongoing studies still omit a suitable attention control and are based on short-term interventions and follow up.

AUTHORS' CONCLUSIONS

Implications for practice

Cardiorespiratory walking training during usual stroke care can increase walking speed and walking distance, and reduce dependence on other people during walking. No other evidence is sufficient to influence practice at the present time, other than the observation that most benefits in fitness, mobility, and physical function appear to be associated with 'task-related' training.

Implications for research

Little is known about the benefits of physical fitness training after stroke, or the optimal regimen for improving fitness. More trials are needed. Resistance training interventions to improve muscle strength and power need investigation but the training must be functionally relevant.

Trials need to be longer: Long-term follow up should be incorporated in all training RCTs. Long-term training interventions (more than 12 weeks) and strategies to facilitate long-term maintenance of physical fitness are under investigated.

Duration of exposure to training interventions and control interventions must be matched to prevent overestimation of treatment effects.

The content of an attention control intervention should be chosen carefully to minimise impact on key outcome measures; this will prevent underestimation of treatment effects caused by control group training effects.

Systematic review of the effects of physical fitness training after stroke is complicated with the availability of new data and would now benefit from being split in relation to specific outcomes of interest.

ACKNOWLEDGEMENTS

We thank the Cochrane Stroke Group for their assistance in preparing the protocol and searching the literature. We would also thank all those who provided information about their own or other trials. If anyone knows of trials that we have omitted we would be grateful if they could contact Dr David Saunders.

REFERENCES

References to studies included in this review

Bateman 2001 *{published and unpublished data}*

Bateman A, Culpan FJ, Pickering AD, Powell JH, Scott OM, Greenwood RJ. The effect of aerobic training on rehabilitation outcomes after recent severe brain injury: a randomized controlled evaluation. *Archives of Physical Medicine and Rehabilitation* 2001;**82**(2):174–82. [MEDLINE: 86]

Cuviello-Palmer 1988 *{published data only}*

Cuviello-Palmer ED. *Effect of the Kinetron II on gait and functional outcome in hemiplegic subjects*. Texas, USA: Texas Womens University, 1988.

da Cunha 2002 *{published data only}*

da Cunha IT, Lim PA, Qureshy H, Henson H, Monga T, Protas EJ. A comparison of regular rehabilitation with supported treadmill ambulation training for acute stroke patients. *Journal of Rehabilitation Research and Development* 2001;**38**(2):245–55.

* da Cunha IT, Lim PA, Qureshy H, Henson H, Monga T, Protas EJ. Gait outcomes after acute stroke rehabilitation with supported treadmill training: a randomized controlled pilot study. *Archives of Physical Medicine and Rehabilitation* 2002;**83**(9):1258–65.

Lim PAC, Henson H, Cunha I, Qureshy H, Monga TN, Protas EJ. Body weight-supported gait training in stroke patients. *American Journal of Physical Medicine and Rehabilitation* 2000;**79**(2):203.

Dean 2000 *{published data only}*

* Dean CM, Richards CL, Malouin F. Task-related circuit training improves performance of locomotor tasks in chronic stroke: a randomized, controlled pilot trial. *Archives of Physical Medicine and Rehabilitation* 2000;**81**(4):409–17. [MEDLINE: 409]

Richards CL, Malouin F, Dean C. Maximizing locomotor recovery after stroke. *Archives of Physiology & Biochemistry* 2000;**108**(1-2):1.

Duncan 1998 *{published and unpublished data}*

Duncan P, Richards L, Wallace D, Stoker-Yates J, Pohl P, Luchies C, et al.A randomized, controlled pilot study of a home-based exercise program for individuals with mild and moderate stroke. *Stroke* 1998;**29**(10):2055–60. [MEDLINE: 815]

Duncan 2003 *{published data only}*

* Duncan P, Studenski S, Richards L, Gollub S, Lai SM, Reker D, et al.Randomized clinical trial of therapeutic exercise in subacute stroke. *Stroke* 2003;**34**(9):2173–80.

Perera S, Mody SH, Woodman RC, Studenski SA. Meaningful change and responsiveness in common physical performance measures in older adults. *Journal of the American Geriatrics Society* 2006;**54**:743–9.

Schmid A, Duncan PW, Studenski S, Lai SM, Richards L, Perera S, et al.Improvements in speed-based gait classifications are meaningful. *Stroke* 2007;**38**:2096–100.

Studenski S, Duncan PW, Perera S, Reker D, Lai SM, Richards L. Daily functioning and quality of life in a randomized controlled trial of therapeutic exercise for subacute stroke survivors. *Stroke* 2005;**36**(8):1764–70.

Eich 2004 *{published data only}*

Eich HJ, Hesse S, Mach H. Aerobic endurance training of hemiparetic patients who are able to walk. Results of a prospective randomised study. *Deutsche Zeitschrift für Sportmedizin* 2003;**54**(7/8):S98.

* Eich HJ, Mach H, Werner C, Hesse S. Aerobic treadmill plus Bobath walking training improves walking in subacute stroke: a randomized controlled trial. *Clinical Rehabilitation* 2004;**18**(6):640–51.

Eich HJ, Parchmann H, Hesse S, Mach H, Werner C. Aerobic treadmill training plus physiotherapy improves walking ability in subacute stroke patients. A randomized controlled study. *Neurologie und Rehabilitation* 2004;**10**(4):187–216.

Fitch S, Elkins M, Moseley A. Was CAP summary faithful?. *Australian Journal of Physiotherapy* 2005;**51**:265–6.

Hesse S, Eich HJ, Mach H, Parchmann H, Werner C. Aerobic treadmill training plus physiotherapy improves walking speed and capacity in subacute, moderately affected patients after stroke. *Neurologie und Rehabilitation* 2005;**11**(1):7–12.

Moseley A. Treadmill training more effective than Bobath training in improving walking following stroke. *Australian Journal of Physiotherapy* 2005;**51**(3):192.

Glasser 1986 *{published data only}*

Glasser L. Effects of isokinetic training on the rate of movement during ambulation in hemiparetic patients. *Physical Therapy* 1986;**66**(5):673–6. [MEDLINE: 2940]

Inaba 1973 *{published data only}*

Inaba M, Edberg E, Montgomery J, Gillis MK. Effectiveness of functional training, active exercise, and resistive exercise for patients with hemiplegia. *Physical Therapy* 1973;**53**(1):28–35. [MEDLINE: 3625]

James 2002 *{unpublished data only}*

James JEP. *Closed kinetic chain training to enhance muscle power, control and retrain dynamic balance under task specific conditions improves functional walking ability in chronic stroke survivors*. Dublin, Ireland: National University of Ireland, 2002.

Katz-Leurer 2003 *{published data only}*

* Katz-Leurer M, Carmeli E, Shochina M. The effect of early aerobic training on independence six months post stroke. *Clinical Rehabilitation* 2003;**17**(7):735.

Katz-Leurer M, Shochina M, Carmeli E, Friedlander Y. The influence of early aerobic training on the functional capacity in patients with cerebrovascular accident at the subacute stage. *Archives of Physical Medicine and Rehabilitation* 2003;**84**:1609–14.

Kim 2001 *{published data only}*

Kim CM, Eng JJ, MacIntyre DL, Dawson AS. Effects of isokinetic strength training on walking in persons with stroke: a double-blind controlled pilot study. *Journal of Stroke and Cerebrovascular Diseases* 2001;**10**(6):265–73.

Mead 2007 *{unpublished data only}*

Mead G. Exercise or relaxation after stroke?. *BMJ* 2005;**330**(7503):1337.

* Mead GE, Greig CA, Cunningham I, Lewis SJ, Dinan S, Saunders DH, et al.Stroke: a randomised trial of exercise or relaxation. *Journal of the American Geriatrics Society* 2007;**55**(6):892–9.

Mead GE, Greig CA, Cunningham I, Lewis SJ, Dinan S, Saunders DH, et al.Stroke: a randomised trial of exercise or relaxation.

Proceedings of the UK Stroke Forum Conference 4-6 December 2007. Harrogate, UK: The Stroke Association, 2007.

Ouellette 2004 *{published data only}*
Ouellette MM, LeBrasseur NK, Bean JF, Phillips E, Stein J, Frontera WR, et al.High-intensity resistance training improves muscle strength, self-reported function, and disability in long-term stroke survivors. *Stroke* 2004;**35**(6):1404–9.

Pohl 2002a *{published data only}*
Pohl M, Mehrholz J, Ritschel C, Ruckriem S. Speed-dependent treadmill training in ambulatory hemiparetic stroke patients: a randomized controlled trial. *Stroke* 2002;**33**(2):553–8.

Pohl 2002b *{published data only}*
Pohl M, Mehrholz J, Ritschel C, Ruckriem S. Speed-dependent treadmill training in ambulatory hemiparetic stroke patients: a randomized controlled trial. *Stroke* 2002;**33**(2):553–8.

Pohl 2007 *{published data only}*
Pohl M, Werner C, Holzgraefe M, Kroczek G, Mehrholz J, Wingendorf I, et al.Repetitive locomotor training and physiotherapy improve walking and basic activities of daily living after stroke: a single-blind, randomized multicentre trial (DEutsche GAngtrainerStudie, DEGAS). *Clinical Rehabilitation* 2007;**21**(1): 17–27.

Potempa 1995 *{published data only}*
Potempa K, Lopez M, Braun LT, Szidon JP, Fogg L, Tincknell T. Physiological outcomes of aerobic exercise training in hemiparetic stroke patients. *Stroke* 1995;**26**(1):101–5. [MEDLINE: 1630]

Richards 1993 *{published data only}*
Malouin F, Richards CL, Wood-Dauphinee S, Williams JI. A randomized controlled trial comparing early and intensive task-specific therapy to conventional therapy in acute stroke patients. *Canadian Journal of Rehabilitation* 1993;**7**(1):27–8. [MEDLINE: 8634]
* Richards CL, Malouin F, Wood-Dauphinee S, Williams JI, Bouchard JP, Brunet D. Task-specific physical therapy for optimization of gait recovery in acute stroke patients. *Archives of Physical Medicine and Rehabilitation* 1993;**74**(6):612–20.

Richards 2004 *{published data only}*
Richards CL, Malouin F, Bravo G, Dumas F, Wood-Dauphinee S. The role of technology in task-oriented training in persons with subacute stroke: a randomized controlled trial. *Neurorehabilitation and Neural Repair* 2004;**18**(4):199–211.

Salbach 2004 *{published data only}*
* Salbach NM, Mayo NE, Robichaud-Ekstrand S, Hanley JA, Richards CL, Wood-Dauphinee S. The effect of a task-oriented walking intervention on improving balance self-efficacy poststroke: a randomized, controlled trial. *Journal of the American Geriatrics Society* 2005;**53**(4):576–82.
Salbach NM, Mayo NE, Wood-Dauphinee S, Hanley JA, Richards CL, Côté R. A task-orientated intervention enhances walking distance and speed in the first year post stroke: a randomized controlled trial. *Clinical Rehabilitation* 2004;**18**(5):509–19.

Teixeira 1999 *{published data only}*
Teixeira L, Nadeau S, Olney S, McBride I, Culham E, Zee B. The impact of a muscle strengthening and physical conditioning program on gait and stairclimbing performance in chronic stroke subjects. *Gait & Posture* 1998;**7**(2):144–5. [MEDLINE: 6811]
Teixeira-Salmela LF, Nadeau S, McBride I, Olney SJ. Effects of muscle strengthening and physical conditioning training on temporal, kinematic and kinetic variables during gait in chronic stroke survivors. *Journal of Rehabilitation Medicine* 2001;**33**(2): 53–60. [MEDLINE: 5770]
* Teixeira-Salmela LF, Olney SJ, Nadeau S, Brouwer B. Muscle strengthening and physical conditioning to reduce impairment and disability in chronic stroke survivors. *Archives of Physical Medicine and Rehabilitation* 1999;**80**(10):1211–8. [MEDLINE: 537]

Winstein 2004 *{published data only}*
Rose DK, Winstein CJ, Tan SM, Azen SP, Chui HC. Comparison of upper extremity intervention strategies at six and nine months post-stroke. *Neurology Report* 2001;**25**(4):130.
Rose DK, Winstein CJ, Yang AN, Weiss WB, Tan SM, Azen SP, et al.Relationship between upper extremity function and impairment in individuals with unilateral stroke. *Neurology Report* 1999;**23**(5): 186.
Winstein CJ, Rose DK, Chui HC, Yang AN, Weiss WB, Tan SM, et al.Recovery and rehabilitation of arm use after stroke. *Journal of Stroke and Cerebrovascular Diseases* 2001;**10**(4):197.
* Winstein CJ, Rose DK, Tan SM, Lewthwaite R, Chui HC, Azen SP. A randomized controlled comparison of upper-extremity rehabilitation strategies in acute stroke: a pilot study of immediate and long-term outcomes. *Archives of Physical Medicine and Rehabilitation* 2004;**85**(4):620–8.

Yang 2006 *{published data only}*
Yang YR, Wang RY, Lin KH, Chu MY, Chan RC. Task-oriented progressive resistance strength training improves muscle strength and functional performance in individuals with stroke. *Clinical Rehabilitation* 2006;**20**:860–70.

References to studies excluded from this review

Ada 2003 *{published data only}*
Ada L, Dean CM, Hall JM, Bampton J, Crompton S. A treadmill and overground walking program improves walking in individuals residing in the community after stroke: a placebo-controlled randomised trial. *Internal Medicine Journal* 2004;**34**(1-2):A7.
* Ada L, Dean CM, Hall JM, Bampton J, Crompton S. A treadmill and overground walking program improves walking in persons residing in the community after stroke: a placebo-controlled, randomized trial. *Archives of Physical Medicine and Rehabilitation* 2003;**84**(10):1486–91.

Akbari 2006 *{published data only}*
Akbari A, Karimi H. The effect of strengthening exercises on exaggerated muscle tonicity in chronic hemiparesis following stroke. *Journal of Medical Sciences* 2006;**6**(3):382–8.

Barreca 2004 *{published data only}*
Barreca S, Sigouin CS, Lambert C, Ansley B. Effects of extra training on the ability of stroke survivors to perform an independent sit-to-stand: a randomized controlled trial. *Journal of Geriatric Physical Therapy* 2004;**27**(2):59–64.

Barreca 2007 *{published data only}*
Barreca SR, Masters L, Sigouin CS. Sit-to-stand training improves standing performance and quality of life in residents living in long-

term care homes following a stroke: a cluster randomized controlled trial. *Stroke* 2007;**38**(2):474.

Baskett 1999 ***{published data only}***
Baskett JJ, Broad JB, Reekie G, Hocking C, Green G. Shared responsibility for ongoing rehabilitation: a new approach to home-based therapy after stroke. *Clinical Rehabilitation* 1999;**13**(1): 23–33. [MEDLINE: 666]

Blennerhassett 2004 ***{published data only}***
Blennerhassett J, Dite W. Additional task-related practice improves mobility and upper limb function early after stroke: a randomised controlled trial. *Australian Journal of Physiotherapy* 2004;**50**(4): 219–24.

Bourbonnais 2002 ***{published data only}***
Bourbonnais D, Bilodeau S, Lepage Y, Beaudoin N, Gravel D, Forget R. Effect of force-feedback treatments in patients with chronic motor deficits after a stroke. *American Journal of Physical Medicine & Rehabilitation* 2002;**81**(12):890–7.

Brown 2002 ***{published data only}***
Brown DA, Burgar CG. Graded weight-bearing exercise for improved ambulation after stroke. http://guide.stanford.edu/projects/2kprojects/stroke06.html 2002.

Butefisch 1995 ***{published data only}***
Butefisch C, Hummelsheim H, Denzler P, Mauritz KH. Repetitive training of isolated movements improves the outcome of motor rehabilitation of the centrally paretic hand. *Journal of the Neurological Sciences* 1995;**130**(1):59–68.

Carr 2003 ***{published data only}***
Carr M, Jones J. Physiological effects of exercise on stroke survivors. *Topics in Stroke Rehabilitation* 2003;**9**(4):57–64.

Chu 2004 ***{published data only}***
Chu KS, Eng JJ, Dawson AS, Harris JE, Ozkaplan A, Gylfadottir S. Water-based exercise for cardiovascular fitness in people with chronic stroke: a randomized controlled trial. *Archives of Physical Medicine and Rehabilitation* 2004;**85**(6):870–4.

Davis 2003 ***{published data only}***
Davis GMF, Kelly JO, Kilbreath SL, Zeman BD. Home-based exercise training improves walking endurance in chronic stroke patients: a pilot study. *Medicine & Science in Sports & Exercise* 2003;**35**(5):S232.

Davis 2006 ***{published data only}***
* Davis GM, Lee M-J, Kilbreath SL, Fiatarone Singh SM, Zeman B. Effect of aerobic or resistance training on cardiorespiratory fitness after chronic stroke. *Neurorehabilitation and Neural Repair* 2006;**20**:188.
Davis GM, Lee M-J, Kilbreath SL, Fiatarone Singh SM, Zeman B. Specificity of training improves aerobic fitness in chronic stroke patients: a randomised controlled trial. *Medicine and Science in Sports and Exercise* 2004;**36**(5):S250.
Lee M-J, Kilbreath SL, Davis GM, Fiatarone Singh SM, Zeman B. Progressive resistance training improves leg muscle strength and stair climbing power in persons following stroke. *Medicine and Science in Sports and Exercise* 2004;**36**(5):S250.
Lee MJ, Kilbreath SL, Fiatarone SM, Zeman B, Lord SR. Comparison of effect of aerobic cycle training and progressive resistance training on walking ability after stroke: a randomized sham exercise-controlled study. *Journal of the American Geriatrics Society* 2008;**56**:976–85.

Dean 1997 ***{published data only}***
Dean CM, Shepherd RB. Task-related training improves performance of seated reaching tasks after stroke. A randomized controlled trial. *Stroke* 1997;**28**(4):722–8. [MEDLINE: 1203]

Desrosiers 2005 ***{published data only}***
Desrosiers J, Bourbonnais D, Corriveau H, Gosselin S, Bravo G. Effectiveness of unilateral and symmetrical bilateral task training for arm during the subacute phase after stroke: a randomized controlled trial. *Clinical Rehabilitation* 2005;**19**(6):581–93.

Di Lauro 2003 ***{published data only}***
Di Lauro A, Pellegrino L, Savastano G, Ferraro C, Fusco M, Balzarano F, et al.A randomized trial on the efficacy of intensive rehabilitation in the acute phase of ischemic stroke. *Journal of Neurology* 2003;**250**:1206–8.

Dickstein 1986 ***{published data only}***
Dickstein R, Hocherman S, Pillar T, Shaham R. Stroke rehabilitation. Three exercise therapy approaches. *Physical Therapy* 1986;**66**(8):1233–8. [MEDLINE: 2995]

Dickstein 1997 ***{published data only}***
Dickstein R, Heffes Y, Laufer Y, Abulaffio N, Shabtai EL. Repetitive practice of a single joint movement for enhancing elbow function in hemiparetic patients. *Perceptual & Motor Skills* 1997;**85** (3 Pt 1):771–85. [MEDLINE: 1041]

Dromerick 2005 ***{published data only}***
* Dromerick AW. VECTORS Very Early Constraint-Induced Treatment for Recovery of Stroke. Trial web page 2005.
Dromerick AW, Lang CE, Birkenmeier R, Hahn MG, Sahrmann SA, Edwards DF. Relationships between upper-limb functional limitation and self-reported disability 3 months after stroke. *Journal of Rehabilitation Research and Development* 2006;**43**(3):401–8.
Edwards DF, Lang CE, Birkenmeier R, Powers WJ, Dromerick AW. VECTORS (Very Early Constraint Therapy for Recovery from Stroke) Phase II RCT: results of secondary analyses. *Stroke* 2008;**39** (2):563.

Drummond 1996 ***{published data only}***
* Drummond A, Walker M. Generalisation of the effects of leisure rehabilitation for stroke patients. *British Journal of Occupational Therapy* 1996;**59**(7):330–4. [MEDLINE: 4293]
Drummond A, Walker MF. A randomized controlled trial of leisure rehabilitation after stroke. *Clinical Rehabilitation* 1995;**9**(4): 283–90. [MEDLINE: 4343]

English 2003 ***{published data only}***
English C, Hillier S, Stiller K, Warden-Flood A. Is task-related circuit training in a group more effective than one-to-one physiotherapy for patients with acute stroke?. Australian Journal of Physiotherapy YR:2005. 51 Vol. 51, issue 4 e–Suppl:S17.
* English C, Warden-Flood A, Stiller K, Hillier S. Is task-related circuit training an effective means of providing rehabilitation to acute stroke patients?. *Australian Journal of Physiotherapy* 2003;**49**(4 Suppl.):s9–s10.
English CK, Hillier SL, Stiller KR, Warden-Flood A. Circuit class therapy versus individual physiotherapy sessions during inpatient stroke rehabilitation: a controlled trial. *Archives of Physical Medicine and Rehabilitation* 2007;**88**:955–63.

Feys 1998 *{published data only}*
Feys HM, De Weerdt WJ, Selz BE, Cox Steck GA, Spichiger R, Vereeck LE, et al.Effect of a therapeutic intervention for the hemiplegic upper limb in the acute phase after stroke: a single-blind, randomized, controlled multicenter trial. *Stroke* 1998;**29**(4): 785–92. [MEDLINE: 6473]

Fletcher 1994 *{published data only}*
Fletcher BJ, Dunbar SB, Felner JM, Jensen BE, Almon L, Cotsonis G, et al.Exercise testing and training in physically disabled men with clinical evidence of coronary artery disease. *The American Journal of Cardiology* 1994;**73**(2):170–4.

Foley 2004 *{published data only}*
Foley SM, O'Sullivan PS, Means KM. Postexercise outcome: does exercise affect functional obstacle course performance in stroke patients?. American Journal of Physical Medicine and Rehabilitation. 83 2004; Vol. 83:249.

Gelber 1995 *{published data only}*
Gelber DA, Josefczyk PB, Herrman D, Good DC, Verhulst SJ. Comparison of two therapy approaches in the rehabilitation of the pure motor hemiparetic stroke patient. *Journal of Neurologic Rehabilitation* 1995;**9**(4):191–6. [MEDLINE: 6489]

Gilbertson 1998 *{published data only}*
Gilbertson L, Langhorne P, Walker A, Allen A. A randomised controlled trial of home-based occupational therapy for stroke patients: results at 7 weeks. *Cerebrovascular Diseases* 1998;**8 Suppl 4**:84. [MEDLINE: 112]

Gregson 2006 *{unpublished data only}*
Gregson J. Exercise Training early after stroke: a feasibility study. Personal communication 2006.

Hart 2004 *{published data only}*
Hart J, Kanner H, Gilboa-Mayo R, Haroeh-Peer O, Rozenthul-Sorokin N, Eldar R. Tai Chi Chuan practice in community-dwelling persons after stroke. *International Journal of Rehabilitation Research* 2004;**27**(4):303–4.

Helbostad 2004 *{published data only}*
Helbostad JL, Sletvold O, Moe-Nilssen R. Effects of home exercises and group training on functional abilities in home-dwelling older persons with mobility and balance problems. A randomized study. *Aging-Clinical & Experimental Research* 2004;**16**(2):113–21.
* Helbostad JL, Sletvold O, Moe-Nilssen R. Home training with and without additional group training in physically frail old people living at home: effect on health-related quality of life and ambulation. *Clinical Rehabilitation* 2004;**18**(5):498–508.

Hidler 2007 *{published data only}*
Hidler JM. Walking therapy in hemiparetic stroke patients using robotic-assisted treadmill training. ClinicalTrials.gov 2007.

Higgins 2006 *{published data only}*
Higgins J, Salbach NM, Wood-Dauphinee S, Richards CL, Cote R, Mayo NE. The effect of a task-oriented intervention on arm function in people with stroke: a randomized controlled trial. *Clinical Rehabilitation* 2006;**20**(4):296–310.

Howe 2005 *{published data only}*
Howe TE, Taylor I, Finn P, Jones H. Lateral weight transference exercises following acute stroke: a preliminary study of clinical effectiveness. *Clinical Rehabilitation* 2005;**19**(1):45–53.

Hu 2003 *{published data only}*
Hu Z, Hu Y, Lu Q. Impact of early rehabilitation therapy on post stroke depression. *Chinese Journal of Clinical Rehabilitation* 2003;**7** (5):849.

Hu 2006 *{published data only}*
Hu Y-S. Effects study of standardized tertiary rehabilitation on promoting of the neurological functions in stroke patients with hemiplegia. *Chinese Medical Journal* 2006;**86**(37):2621–6.

Ishida 2001 *{published data only}*
Ishida A, Tanaka H, Toyokura M, Izumi S. Early rehabilitative intervention for stroke - prospective study. The 1st World Congress of the International Society of Physical Rehabilitation Medicine (ISPRM I) July 7th-13th 2001. The Netherlands, Amsterdam: International Society of Physical Rehabilitation Medicine (ISPRM I), 2001:500–4.

Jongbloed 1989 *{published data only}*
Jongbloed L, Stacey S, Brighton C. Stroke rehabilitation: sensorimotor integrative treatment versus functional treatment. *American Journal of Occupational Therapy* 1989;**43**(6):391–7. [MEDLINE: 2675]

Jongbloed 1991 *{published data only}*
Jongbloed L, Morgan D. An investigation of involvement in leisure activities after a stroke. *American Journal of Occupational Therapy* 1991;**45**(5):420–7. [MEDLINE: 2384]

Kamps 2005 *{published data only}*
Kamps A, Schule K. Cyclic movement training of the lower limb in stroke rehabilitation. *Neurologie und Rehabilitation* 2005;**11**(5): 259–69.

Klassen 2005 *{published data only}*
Klassen T, Mulroy SJ, Sullivan KJ. Gait parameters associated with responsiveness to a task-specific and/or strength training program post-stroke. Journal of Neurologic Physical Therapy. 29 2005; Vol. 29, issue 4:198.

Kwakkel 1999 *{published data only}*
Kwakkel G, Wagenaar RC, Twisk JW, Lankhorst GJ, Koetsier JC. Intensity of leg and arm training after primary middle-cerebral-artery stroke: a randomised trial. *Lancet* 1999;**354**:191–6.

Laufer 2001 *{published data only}*
Laufer Y, Dickstein R, Chefez Y, Marcovitz E. The effect of treadmill training on the ambulation of stroke survivors in the early stages of rehabilitation: a randomized study. *Journal of Rehabilitation Research & Development* 2001;**38**(1):69–78.

LEAPS *{published data only}*
Duncan PW. Locomotor Experience Applied Post-Stroke (LEAPS). *Stroke* 2007;**38**:e120.
Duncan PW, Sullivan KJ, Behrman AL, Azen SP, Wu SS, Dobkin BH, et al.Locomotor Experience Applied Post-Stroke (LEAPS): a randomized controlled trial. *International Journal of Stroke* 2008;**3 Suppl 1**:132.
Duncan PW, Sullivan KJ, Behrman AL, Azen SP, Wu SS, Nadeau SE, et al.Locomotor Experience Applied Post-Stroke (LEAPS): a randomized controlled trial. International Stroke Conference 2008. New Orleans, 2008.
Rose DK, Behrman AL, Cen CY, Sullivan KJ, Martin AD, Schofield RS, et al.Response to exercise tolerance testing in

subacute stroke across severity levels. *International Journal of Stroke* 2008;**3 Suppl 1**:329.

* Rose DK, Behrman AL, Cen Y, Sullivan KJ, Martin D, Schofield RS. Response to exercise tolerance testing in subacute stroke across severity levels. *Stroke* 2008;**39**(2):618–9.

Tilson JK, Sullivan KJ, Cen SY, Rose DK, Behrman AL, Wu SS, et al.Determination of the minimal clinically important difference in the lower extremity Fugl-Meyer Motor Score in the first 60 days post-stroke. *Stroke* 2008;**39**(2):693.

Leveille 1998 *{published data only}*

Leveille SG, Wagner EH, Davis C, Grothaus L, Wallace J, LoGerfo M, Kent D. Preventing disability and managing chronic illness in frail older adults: a randomized trial of a community-based partnership with primary care. *Journal of the American Geriatrics Society* 1998;**46**(10):1191–8.

Lin 2004 *{published data only}*

Lin J-H, Hsieh C-L, Lo SK, Chai H-M, Liao L-R. Preliminary study of the effect of low-intensity home-based physical therapy in chronic stroke patients. *Kaohsiung Journal of Medical Sciences* 2004; **20**(1):18–23.

Lincoln 1999 *{published data only}*

Lincoln NB, Parry RH, Vass CD. Randomized, controlled trial to evaluate increased intensity of physiotherapy treatment of arm function after stroke. *Stroke* 1999;**30**(3):573–9. [MEDLINE: 708]

Lincoln 2003 *{published data only}*

Lincoln N. Comparison of Bobath-based and movement science based treatment for stroke: a randomised controlled trial. Nadina.Lincoln@nottingham.ac.uk 2003.

Lindsley 1994 *{published data only}*

Lindsley HG, Musser L, Stewart MR, Burton L, Forgione KO, Martin M, et al.The effects of Kinetron training on gait patterns of patients with strokes. Tar Heel Journal 1994; Vol. 91:8.

Liston 2000 *{published data only}*

Liston R, Mickelborough J, Harris B, Hann A, Tallis R. Conventional physiotherapy and treadmill re-training for higher-level gait disorders in cerebrovascular disease. *Age and Ageing* 2000; **29**(4):311–8.

Logan 2003 *{published data only}*

Logan PA, Gladman JR, Drummond AE, Radford KA, TOTAL Study Group. A study of interventions and related outcomes in a randomized controlled trial of occupational therapy and leisure therapy for community stroke patients. *Clinical Rehabilitation* 2003;**17**(3):249–55.

Logigian 1983 *{published data only}*

Logigian MK, Samuels MA, Falconer J, Zagar R. Clinical exercise trial for stroke patients. *Archives of Physical Medicine and Rehabilitation* 1983;**64**(8):364–7. [MEDLINE: 3237]

Luft 2004 *{published data only}*

Luft AR, McCombe-Waller S, Whitall J, Forrester LW, Macko R, Sorkin JD, et al.Repetitive bilateral arm training and motor cortex activation in chronic stroke: a randomized controlled trial. *JAMA* 2004;**292**(15):1853–61.

Whitall J. Upper extremity training for chronic stroke. CRISP Database 2002.

Macko 2005 *{published data only}*

Macko RF. Effects of exercise on patients with hemiparetic stroke. clinicaltrials.gov 2001.

Macko RF, Ivey FM, Forrester LW, Hanley D, Sorkin JD, Katzel LI, et al.Treadmill exercise rehabilitation improves ambulatory function and cardiovascular fitness in patients with chronic stroke: a randomized, controlled trial. *Stroke* 2005;**36**(10):2206–11.

Maeshima 2003 *{published data only}*

Maeshima S, Ueyoshi A, Osawa A, Ishida K, Kunimoto K, Shimamoto Y, et al.Mobility and muscle strength contralateral to hemiplegia from stroke: benefit from self-training with family support. *American Journal of Physical Medicine and Rehabilitation* 2003;**82**(6):456–62.

Marigold 2005 *{published data only}*

Marigold DS, Eng JJ, Dawson AS, Inglis JT, Harris JE, Gylfadottir S. Exercise leads to faster postural reflexes, improved balance and mobility, and fewer falls in older persons with chronic stroke. *Journal of the American Geriatrics Society* 2005;**53**(3):416–23.

McClellan 2004 *{published data only}*

* McClellan R, Ada L. A six-week, resource-efficient mobility program after discharge from rehabilitation improves standing in people affected by stroke: placebo-controlled, randomised trial. *Australian Journal of Physiotherapy* 2004;**50**(3):163–7.

McClellan R, Ada L. Efficacy of a resource-efficient exercise program in reducing disability and handicap in stroke survivors: a randomised controlled clinical trial. *Internal Medicine Journal* 2004;**34**(1-2):A11.

Michaelsen 2006 *{published data only}*

Michaelsen SM, Dannenbaum R, Levin MF. Task-specific training with trunk restraint on arm recovery in stroke: randomized control trial. *Stroke* 2006;**37**(1):186–92.

Miller 2000 *{published data only}*

Miller K, Galea M, Kilbreath S. Early task-related upper limb training is effective following stroke. Stroke 2000; Vol. 31, issue 11:2816.

Moreland 2003 *{published data only}*

Moreland JD, Goldsmith CH, Huijbregts MP, Anderson RE, Prentice DM, Brunton KB, et al.Progressive resistance strengthening exercises after stroke: a single-blind randomized controlled trial. *Archives of Physical Medicine and Rehabilitation* 2003;**84**(10):1433–40.

Nelles 2001 *{published data only}*

Nelles G, Jentzen W, Jueptner M, Muller S, Diener HC. Arm training induced brain plasticity in stroke studied with serial positron emission tomography. *NeuroImage* 2001;**13**(6):1146–54.

Nilsson 2001 *{published data only}*

Nilsson L, Carlsson J, Danielsson A, Fugl-Meyer A, Hellstrom K, Kristensen L, et al.Walking training of patients with hemiparesis at an early stage after stroke: a comparison of walking training on a treadmill with body weight support and walking training on the ground. *Clinical Rehabilitation* 2001;**15**(5):515–27.

Olney 2006 *{published data only}*

Olney SJ, Nymark J, Brouwer B, Culham E, Day A, Heard J, et al.A randomized controlled trial of supervised versus unsupervised exercise programs for ambulatory stroke survivors. *Stroke* 2006;**37** (2):476–81.

Pan 2004 *{published data only}*

Pan C-H, He J-Q, Pu S-X, Wan X-L, Gao C. Effects of early rehabilitation therapy on the motor function of limbs and ability of daily living in patients with hemiplegia after stroke. *Zhongguo Linchuang Kangfu* 2004;**8**(13):2404–5.

Pang 2006b *{published data only}*

Pang MY, Eng JJ, Dawson AS, McKay HA, Harris JE. A community-based fitness and mobility exercise program for older adults with chronic stroke: a randomized, controlled trial. *Journal of the American Geriatrics Society* 2005;**53**(10):1667–74.

* Pang MY, Harris JE, Eng JJ. A community-based upper-extremity group exercise program improves motor function and performance of functional activities in chronic stroke: a randomized controlled trial. *Archives of Physical Medicine and Rehabilitation* 2006;**87**(1): 1–9.

Parker 2001 *{published data only}*

Parker CJ, Gladman JR, Drummond AE, Dewey ME, Lincoln NB, Barer D, et al.A multicentre randomized controlled trial of leisure therapy and conventional occupational therapy after stroke. TOTAL Study Group. Trial of Occupational Therapy and Leisure. *Clinical Rehabilitation* 2001;**15**(1):42–52. [MEDLINE: 6691]

Parry 1999 *{published data only}*

Parry RH, Lincoln NB, Vass CD. Effect of severity of arm impairment on response to additional physiotherapy early after stroke. *Clinical Rehabilitation* 1999;**13**(3):187–98. [MEDLINE: 6693]

Partridge 2000 *{published data only}*

Partridge C, Mackenzie M, Edwards S, Reid A, Jayawardena S, Guck N, et al.Is dosage of physiotherapy a critical factor in deciding patterns of recovery from stroke: a pragmatic randomized controlled trial. *Physiotherapy Research International* 2000;**5**(4): 230–40. [MEDLINE: 6694]

Peel 1995 *{published data only}*

Peel C, Utsey C. Role of endurance exercise in older persons with physical disabilities resulting from CVA: a case report. *Issues on Aging* 1995;**18**(1):19–24. [MEDLINE: 3745]

Peng 2002 *{published data only}*

Peng H-L. Influence of facilitation techniques on early active rehabilitation in upper extremity, hand and walk function of hemiplegia patients with stroke. *Zhongguo Linchuang Kangfu* 2002; **6**(9):1255–6.

Peurala 2005 *{published data only}*

Peurala SH, Pitkanen K, Sivenius J, Tarkka I. Body-weight supported gait exercise compared with floor walking in chronic stroke patients. *Archives of Physical Medicine and Rehabilitation* 2004;**85**:E7.

Peurala SH, Pitkanen K, Sivenius J, Tarkka IM. Body-weight supported gait trainer exercises with or without functional electrical stimulation improves gait in patients with chronic stroke. Neurorehabilitation and Neural Repair 2006; Vol. 20, issue 1:98.

* Peurala SH, Tarkka IM, Pitkanen K, Sivenius J. The effectiveness of body weight-supported gait training and floor walking in patients with chronic stroke. *Archives of Physical Medicine and Rehabilitation* 2005;**86**(8):1557–64.

Pitsch 2006 *{published data only}*

Pitsch E, Byl N, Abrams G. Training volume heightens recovery in patients stable post-stroke. Archives of Physical Medicine and Rehabilitation. 87 2006; Vol. 87:E4.

Platz 2001 *{published data only}*

Platz T, Winter T, Muller M, Pinkowski C, Eickhof C, Mauritz K-H. Arm ability training for stroke and traumatic brain injury patients with mild to moderately severe arm paresis. *Neurologie und Rehabilitation* 2000;**6**(5):245–50.

* Platz T, Winter T, Muller N, Pinkowski C, Eickhof C, Mauritz KH. Arm ability training for stroke and traumatic brain injury patients with mild arm paresis: a single-blind, randomized, controlled trial. *Archives of Physical Medicine and Rehabilitation* 2001;**82**(7):961–8.

Platz 2005 *{published data only}*

Platz T, Eickhof C, van Kaick S, Engel U, Pinkowski C, Kalok S, et al.Impairment-oriented training for arm paresis after stroke: a single blind, randomised, controlled multicentre trial. *Neurologie und Rehabilitation* 2004;**10**(4):169–78.

* Platz T, Eickhof C, van Kaick S, Engel U, Pinkowski C, Kalok S, et al.Impairment-oriented training or Bobath therapy for severe arm paresis after stroke: a single-blind, multicentre randomized controlled trial. *Clinical Rehabilitation* 2005;**19**(7):714–24.

Platz T, van Kaick S, Moller L, Freund S, Winter T, Kim IH. Impairment-oriented training and adaptive motor cortex reorganisation after stroke: a fTMS study. *Journal of Neurology* 2005;**252**:1363–71.

Pomeroy 2001 *{published data only}*

Pomeroy VM, Evans B, Falconer M, Jones D, Hill E, Giakas G. An exploration of the effects of weighted garments on balance and gait of stroke patients with residual disability. *Clinical Rehabilitation* 2001;**15**(4):390–7.

Rimmer 2000 *{published data only}*

Rimmer JH, Riley B, Creviston T, Nicola T. Exercise training in a predominantly African-American group of stroke survivors. *Medicine & Science in Sports & Exercise* 2000;**32**(12):1990–6. [MEDLINE: 89]

Shatil 2005 *{published data only}*

Shatil S, Ivanova TD, Mochizuki G, Garland SJ. Effects of therapeutic golf rehabilitation on golf performance, balance, and quality of life in individuals following stroke: pilot study. *Physiotherapy Canada* 2005;**57**(2):101–11.

Shimada 2003 *{published data only}*

Shimada H, Uchiyama Y, Kakurai S. Specific effects of balance and gait exercises on physical function among the frail elderly. *Clinical Rehabilitation* 2003;**17**(5):472.

Shimizu 2002 *{published data only}*

Shimizu ME, Ishizaki F, Nakamura S. Results of a home exercise program for patients with osteoporosis resulting from neurological disorders. *Hiroshima Journal of Medical Sciences* 2002;**51**(1):15–22.

Sivenius 2007 *{published data only}*

* Peurala SH, Airaksinen O, Jakala P, Tarkka IM, Sivenius J. Intensive walking and exercise therapy during early acute stage of stroke. ISPGR 2007. 18th International Conference of the

International Society for Posture and Gait Research. Vermont, 2007.
Sivenius J, Peurala S. Gait trainer vs traditional physiotherapy in acute stroke. clinicaltrials.gov 2007.

Smith 1981 *{published data only}*
Smith DS, Goldenberg E, Ashburn A, Kinsella G, Sheikh K, Brennan PJ, et al.Remedial therapy after stroke: a randomised controlled trial. *BMJ* 1981;**282**(6263):517–20. [MEDLINE: 3357]

Sullivan 2002 *{published data only}*
Sullivan KJ, Knowlton BJ, Dobkin BH. Step training with body weight support: effect of treadmill speed and practice paradigms on poststroke locomotor recovery. *Archives of Physical Medicine and Rehabilitation* 2002;**83**(5):683.

Sunderland 1994 *{published data only}*
* Sunderland A, Fletcher D, Bradley L, Tinson D, Hewer RL, Wade DT. Enhanced physical therapy for arm function after stroke: a one year follow up study. *Journal of Neurology Neurosurgery & Psychiatry* 1994;**57**(7):856–8. [MEDLINE: 1796]
Sunderland A, Tinson DJ, Bradley EL, Fletcher D, Langton HR, Wade DT. Enhanced physical therapy improves recovery of arm function after stroke. A randomised controlled trial. *Journal of Neurology Neurosurgery & Psychiatry* 1992;**55**(7):530–5. [MEDLINE: 2119]

Suputtitada 2004 *{published data only}*
Suputtitada A, Yooktanan P, Rarerng-Ying T. Effect of partial body weight support treadmill training in chronic stroke patients. *Journal of the Medical Association of Thailand* 2004;**87**(Suppl 2): S107–S111.

Thielman 2004 *{published data only}*
Thielman GT, Dean CM, Gentile AM. Rehabilitation of reaching after stroke: task-related training versus progressive resistive exercise. *Archives of Physical Medicine and Rehabilitation* 2004;**85** (10):1613–8.

Thielman 2005 *{published data only}*
Thielman, GT. *Training with trunk restraint during reaching for individuals post-stroke*. Teachers College, Columbia University, 2005.

Trueblood 2001 *{published data only}*
Trueblood PR. Partial body weight treadmill training in persons with chronic stroke. *Neurorehabilitation* 2001;**16**(3):141.

Turton 2004 *{published data only}*
Turton AJ, Butler SR. A multiple case design experiment to investigate the performance and neural effects of a programme for training hand function after stroke. *Clinical Rehabilitation* 2004;**18** (7):754–63.

van der Lee 1999 *{published data only}*
van der Lee JH, Wagenaar RC, Lankhorst GJ, Vogelaar TW, Deville WL, Bouter LM. Forced use of the upper extremity in chronic stroke patients: results from a single-blind randomized clinical trial. *Stroke* 1999;**30**(11):2369–75. [MEDLINE: 541]

Walker 1999 *{published data only}*
Walker MF, Gladman J, Lincoln NB, Siemonsma P, Whiteley T. A randomized controlled trial of occupational therapy for stroke patients not admitted to hospital. *Clinical Rehabilitation* 1999;**13**: 527. [MEDLINE: 40]
* Walker MF, Gladman JR, Lincoln NB, Siemonsma P, Whiteley T. Occupational therapy for stroke patients not admitted to hospital: a randomised controlled trial. *Lancet* 1999;**354**(9175):278–80. [MEDLINE: 6848]
Walker MF, Gladman JRF, Lincoln NB. A randomised controlled trial of occupational therapy: results at one year. *Cerebrovascular Disease* 2000;**10 Suppl 2**:61. [MEDLINE: 2]
Walker MF, Gladman JRF, Lincoln NB. A randomised controlled trial of occupational therapy for stroke patients not admitted to hospital. *Cerebrovascular Diseases* 1999;**9 Suppl 1**:123. [MEDLINE: 38]

Werner 1996 *{published data only}*
Werner RA, Kessler S. Effectiveness of an intensive outpatient rehabilitation program for postacute stroke patients. *American Journal of Physical Medicine & Rehabilitation* 1996;**75**(2):114-124 & 140. [MEDLINE: 4332]

Werner 2002 *{published data only}*
Werner C, von Frankenberg S, Treig T, Konrad M, Hesse S. Treadmill training with partial body weight support and an electromechanical gait trainer for restoration of gait in subacute stroke patients: a randomized crossover study. *Stroke* 2002;**33**(12): 2895–901.

Widén Holmqvist 1998 *{published data only}*
Widén Holmqvist L, von Koch L, Kostulas V, Holm M, Widsell G, Tegler H, et al.A randomized controlled trial of rehabilitation at home after stroke in southwest Stockholm. *Stroke* 1998;**29**(3): 591–7. [MEDLINE: 955]

Wing 2006 *{published data only}*
Wing A, Johannsen L, Pelton T, van Vliet P, Riddoch J, Sackley C, et al.Bilateral leg movement training in chronic hemiparesis: a pilot RCT. UK Stroke Forum Conference. Harrogate, 2006.

Wolfe 2000 *{published data only}*
Wolfe CD, Tilling K, Rudd AG. The effectiveness of community-based rehabilitation for stroke patients who remain at home: a pilot randomized trial. *Clinical Rehabilitation* 2000;**14**(6):563–9. [MEDLINE: 213]

Xiao 2002 *{published data only}*
Xiao X-H, Xu J-X, Tan J-W. Effect of unilateral bridging activities on regional cerebral blood flow and the recovery of the affected limb function of cerebral infarction in the early stage post stroke. *Zhongguo Linchuang Kangfu* 2002;**6**(5):644–5.

Yang 2005 *{published data only}*
Yang YR, Yen JG, Wang RY, Yen LL, Lieu FK. Gait outcomes after additional backward walking training in patients with stroke: a randomized controlled trial. *Clinical Rehabilitation* 2005;**19**(3): 264–73.

Yokokawa 1999 *{published data only}*
Yokokawa Y, Minamisawa H, Sato H, Kai I, Nakajima T, Fukusima Y. Psychological effect of a physical activity program on community people with cerebral apoplexy. 13th International Congress of the World Confederation for Physical Therapy May 23 - 28 1999. Japan, Yokohama: World Confederation for Physical Therapy, 1999:559. [: Abstract PO–RR–575–27]

References to studies awaiting assessment

Atchison 1996 *{published data only}*

* Atchison JW, Knapp L, Oeffinger D, Mainous A, Salcido R. The risk of post-stroke falls based on timed 'up & go' testing and isotonic quadriceps weight lifting. *Archives of Physical Medicine and Rehabilitation* 1996;**77**(9):932.

Atchison JW, Simpson L, Knapp L, Oeffinger D, Mainous A. Increased isotonic quadricep strength following stroke with a six-week exercise program. *Archives of Physical Medicine and Rehabilitation* 1995;**76**(11):1041.

Au-Yeung 2007 *{published data only}*

Au-Yeung S, Hui-Chan C, Tang J. Tai Chi improves standing balance in people with chronic stroke. ISPGR 2007. 18th International Conference of the International Society for Posture and Gait Research. Vermont, 2007.

AVERT phase II *{published data only}*

Bernhardt J. Meeting the challenges of developing and conducting a multi-centre randomised controlled trial of very early rehabilitation (AVERT). Internal Medicine Journal Vol. 37 Suppl 1, issue Suppl 1:A2.

* Bernhardt J, Chan J, Nicola I, Collier JM. Little therapy, little physical activity: rehabilitation within the first 14 days of organized stroke unit care. *Journal of Rehabilitation Medicine* 2007;**39**:43–8.

Bernhardt J, Dewey H, Collier J, Lindley R, Thrift A, Donnan G. A very early rehabilitation trial (AVERT): phase II safety and feasibility results. Internal Medicine Journal 2007; Vol. 37 Suppl 1: A9.

Bernhardt J, Dewey H, Collier J, Thrift A, Lindley R, Moodie M, et al.A Very Early Rehabilitation Trial (AVERT). *International Journal of Stroke* 2006;**1**(3):69–171.

Bernhardt J, Dewey H, Collier J, Thrift A, Sharpley T, Donnan G. A Very Early Rehabilitation Trial (AVERT) phase II safety and feasibility results. *Stroke* 2007;**38**(2):473.

Bernhardt J, Dewey H, Collier J, Thrift A, Sharpley T, Donnan G. Safety and feasibility results of a very early rehabilitation trial (AVERT): phase II. *Cerebrovascular Diseases* 2007;**23 Suppl 2**:6.

Bernhardt J, Dewey H, Thrift A, Collier J, Donnan G. A Very Early Rehabilitation Trial for Stroke (AVERT). Phase II Safety and Feasibility. *Stroke* 2008;**39**:390–6.

Bernhardt J, Dewey HM, Collier JM, Thrift AG, Donnan GA. Feasibility and safety of a multicentre randomised controlled trial of very early rehabilitation (AVERT): Phase II. *Cerebrovascular Diseases* 2006;**21 Suppl 4**:135.

Collier J, Bernhardt J. Does acute stroke unit care change during a rehabilitation clinical trial (AVERT Phase II)?. Cerebrovascular Diseases 2007; Vol. 23 Suppl 2:96.

Collier JM, Bernhardt J. Clinical trial data collection using a personal digital assistant. Internal Medicine Journal 2005; Vol. 35 Suppl 2:A17.

Collier JM, Cumming TB, Thrift AG, Bernhardt J. The effect of very early mobilisation on mood after stroke. Cerebrovascular Diseases 2008; Vol. 25 Suppl 2:30–1.

Tay-Teo K, Moodie M, Bernhardt J, Thrift A, Collier J, Donnan G, et al.Economic evaluation alongside a phase II multi-centre randomised controlled trial of very early rehabilitation after stroke (AVERT). Cerebrovascular Diseases 2007; Vol. 23 Suppl 2:30.

Tyedin K, Cumming T, Bernhardt J. Very early rehabilitation after stroke may improve long-term quality of life. Internal Medicine Journal 2008; Vol. 38 Suppl 4:A76.

AVERT phase III *{published data only}*

Bernhardt J, Dewey H, Collier J, Thrift A, Lindley R, Moodie M, et al.A very early rehabilitation trial (AVERT): ongoing phase III trial testing efficacy & cost effectiveness of very early mobilisation after stroke. International Journal of Stroke 2008; Vol. 3 Suppl 1:257.

* Bernhardt J, Dewey H, Collier J, Thrift A, Lindley R, Moodie M, et al.A Very Early Rehabilitation Trial (AVERT): ongoing phase III trial testing efficacy and cost effectiveness of very early mobilisation after stroke. Internal Medicine Journal 2008; Vol. 38 Suppl 4: A110.

Bernhardt J, Dewey H, Collier J, Thrift A, Moodie M, Lindley R. A Very Early Rehabilitation Trial (AVERT): ongoing phase III trial testing efficacy & cost effectiveness of very early mobilisation after stroke. International Stroke Conference 2008. New Orleans, 2008.

Bernhardt J, Dewey H, Collier JM, Thrift A, Lindley R, Moodie M, et al.Safety in the first 170 patients of a very early rehabilitation trial (AVERT Phase III). Cerebrovascular Diseases 2008; Vol. 25 Suppl 2:45.

Chen R. Taking the ivory tower of academic research into the clinical world: clinicians' experiences of participating in an international rehabilitation trial (AVERT). Internal Medicine Journal 2008; Vol. 38 Suppl 4:A75.

Donnan G. Stroke rehabilitation: How early should it begin?. Stroke Rehab 2006. Evidence for Stroke Rehabilitation - Bridging into the Future. Goteborg, 2006.

Zhao H, Collier JM, Quah DM, Purvis T, Bernhardt J. The Modified Rankin Scale as a measure of acute stroke disability. Internal Medicine Journal 2008; Vol. 38 Suppl 4:A111.

Bale 2008 *{published data only}*

Bale M, Strand LI. Does functional strength training of the leg in subacute stroke improve physical performance? A pilot randomized controlled trial. *Clinical Rehabilitation* 2008;**22**:911–21.

Chi 2002 *{published data only}*

Brown DA, Nagpal S, Chi S. Limb-loaded cycling program for locomotor intervention following stroke. *Physical Therapy* 2005;**85** (2):159–68.

* Chi SC, Brown DA, Harvey RL. Limb loaded cycling for improving weight-bearing capacity during locomotion in patients post-stroke. *Neurology Report* 2002;**26**(4):186–7.

Cooke 2007 *{published data only}*

Cooke E, Tallis R, Pomeroy V. The effects of different intensity of exercise-based physiotherapy on motor recovery in the lower limb after stroke: a meta-analysis. Proceedings of the UK Stroke Forum Conference 4-6 December 2007. Harrogate, UK: The Stroke Association, 2007.

* Cooke EV, Tallis RC, Pomeroy VM. The effects of different intensity of exercise-based physiotherapy on motor recovery in the lower limb after stroke: a meta-analysis. *Cerebrovascular Diseases* 2007;**23 Suppl 2**:34.

Coupar 2007 *{published data only}*

Coupar F, Van Wijck F, Morris J, Pollock A, Langhorne P. Simultaneous bilateral training for improving arm function after stroke: a Cochrane Systematic review. UK Stroke Forum Conference 2007. Harrogate, 2007.

* Coupar FM, Van Wijck F, Pollock A, Morris J, Langhorne P. Simultaneous bilateral training for improving arm function after stroke. Cerebrovascular Diseases 2007; Vol. 23 Suppl 2:77.

Dias 2007 *{unpublished data only}*

* Dias D, Lains J, Pereira A, Nunes R, Caldas J, Amaral C. Can we improve gait skills in chronic hemiplegics? A randomised control trial with gait trainer. *Europa Medicophysica* 2007;**43**:499–504.

Dias D, Lains J, Pereira A, Nunes R, Caldas J, Amaral C. Partial body weight support in chronic hemiplegics: a randomized control trial. Personal communication 2007.

Domashenko 2008 *{published data only}*

* Domashenko MA, Chernikova LA, Loskutnikova MA, Kistenev BA, Zimin AA, Shestakova MV. The early activization of patients with acute ischemic stroke using tilt-table with integrated robotic stepping functions. International Journal of Stroke 2008; Vol. 3 Suppl 1:340.

Domashenko MA, Loskutnikov MA, Shestakova MV, Kistenev BA, Maksimova MY, Chernikova LA, et al.The efficacy of early verticalization in patients with an acute ischemic stroke. International Journal of Stroke 2008; Vol. 3 Suppl 1:340.

Donaldson 2007 *{published data only}*

Donaldson C, Tallis R, Miller S, Sunderland A, Lemon R, Pomeroy V. The effects of current physical therapy and functional strength training on upper limb function and neuromuscular weakness after stroke: a pilot study. Proceedings of the UK Stroke Forum Conference. Harrogate UK: The Stroke Association, 4–6 December 2007:Abst. poster 156.

* Donaldson C, Tallis R, Pomeroy V. The effects of current physical therapy and functional strength training on upper limb function and neuromuscular weakness after stroke: a pilot study. Cerebrovascular Diseases 2007; Vol. 23 Suppl 2:130.

Du 2006 *{published data only}*

Du J-B, Song W-Q, Wang M-B. The application of partial body weight support treadmill training in hemiplegia rehabilitation after stroke. *Chinese Journal of Cerebrovascular Diseases* 2006;**3**(8):361–4.

Duncan 2001 *{published data only}*

* Duncan P, Fryer J, Mongiardo V. Coordination of hemiparetic movement after post-stroke rehabilitation. clinicaltrials.gov [electronic database] 2001.

Kautz SA, Duncan PW. Coordination of hemiparetic movement after post-stroke rehabilitation. http://guide.stanford.edu/projects/01projects/kautz1.html 2002.

Edinger 2003 *{published data only}*

Edinger K, Herbold J, Mohr D, Vaidya S. Value of a fitness program after completion of rehabilitation therapy poststroke. *Archives of Physical Medicine and Rehabilitation* 2003;**84**(10):E10. [: Poster 31:]

Fang 2001 *{published data only}*

Fang QJ, Jianhua L, Hanlin L. Effects of therapeutic exercise on exercise ability in stroke patients with hemiplegia. Neurorehabilitation and Neural Repair 2001; Vol. 15, issue 4:341. [: Abstract T108]

Flansbjer 2008 *{published data only}*

* Flansbjer UB, Miller M, Downham D, Lexell J. Progressive resistance training after stroke: effects on muscle strength, muscle tone, gait performance and perceived participation. *Journal of Rehabilitation Medicine* 2008;**40**:42–8.

Flansbjer UB, Miller M, Lexell J. Progressive resistance training after stroke: effects on muscle function, gait performance and perceived participation. Stroke Rehab 2006. Evidence for Stroke Rehabilitation - Bridging into the Future. Goteborg, 2006.

French 2007 *{published data only}*

* French B, Leathley MJ, Sutton CJ, Thomas LH, McAdam J, Watkins CL. Does repetitive task training after stroke impact on function?. *Cerebrovascular Diseases* 2007;**23 Suppl 2**:78.

French B, Thomas LH, Leathley MJ, Sutton CJ, McAdam J, Forster A. A Cochrane systematic review of repetitive task training after stroke. Proceedings of the UK Stroke Forum Conference 4-6 December 2007. Harrogate, UK: The Stroke Association, 2007.

Han 2005 *{published data only}*

Han G. Effect of shoulder girdle training on the upper extremity function of stroke patient. Proceedings of 3rd World Congress of the International Society of Physical and Rehabilitation Medicine - ISPRM. Sao Paulo, 2005.

Haworth 2007 *{published data only}*

Haworth J, Young C. A study to investigate the effects of a short exercise and education programme on exercise self-efficacy and levels of activity in adults with acquired neurological pathologies. *Clinical Rehabilitation* 2007;**21**:1147.

Henderson 2007 *{published data only}*

Henderson A, Korner-Bitensky N, Levin M. Virtual reality in stroke rehabilitation: a systematic review of its effectiveness for upper limb motor recovery. *Topics in Stroke Rehabilitation* 2007;**14**(2):52–61.

Hou 2006 *{published data only}*

Hou H, Wang T, Wang H. Effects of 3-phase rehabilitation on functional outcome in hemiplegia after stroke. *Chinese Journal of Rehabilitation Medicine* 2006;**21**(1):61–3.

Jang 2005 *{published data only}*

Jang SJ, Park SW, Kim ES, Wee HM, Kim YH. Electromechanical gait trainer for restoring gait in hemiparetic stroke patients. Proceedings of 3rd World Congress of the International Society of Physical and Rehabilitation Medicine - ISPRM. Sao Paulo, 2005.

Koc 2008 *{published data only}*

Koc A, Turgut G, Kilic M, Karabulut N, Tufekci FG, Kockar C. Exercise therapy for vital symptoms and daily functioning. *International Journal of Stroke* 2008;**3 Suppl 1**:297.

Kyung 1999 *{published data only}*

Kyung JC, Kim TS, Kim SH, Rou TW, Rou JS. Early exercise effect in stroke patients. *Archives of Physical Medicine and Rehabilitation* 1999;**80**:1136.

Langhammer 2008 *{published data only}*

Langhammer B, Lindmark B, Stanghelle JK. An evaluation of two different exercise regimes during the first year following stroke. A randomised controlled trial. ISPGR 2007. 18th International

Conference of the International Society for Posture and Gait Research. Vermont, 2007.
Langhammer B, Lindmark B, Stanghelle JK. Stroke patients and long-term training: is it worthwhile? A randomized comparison of two different training strategies after rehabilitation. *Clinical Rehabilitation* 2007;**21**:495–510.
Langhammer B, Lindmark B, Stanghelle KJ. Activity and exercise in a long perspective. A solution for chronic stroke patients?. Stroke Rehab 2006. Evidence for Stroke Rehabilitation - Bridging into the Future. Goteborg, 2006.
Langhammer B, Stanghelle JK. Bobath or motor relearning programme? A comparison of two different approaches of physiotherapy in stroke rehabilitation: a randomised controlled trial. *Australian Journal of Physiotherapy* 2005;**51**(4 e-Suppl):S23.
Langhammer B, Stanghelle JK. Bobath or motor relearning programme? A follow-up one and four years post stroke. Australian Journal of Physiotherapy 2005; Vol. 51, issue 4 e–Suppl:S23.
* Langhammer B, Stanghelle JK, Lindmark B. Exercise and health-related quality of life during the first year following acute stroke. A randomized controlled trial. *Brain Injury* 2008;**22**(2):135–45.
Langhammer BM. Stroke: reduction of physical performance post stroke. Inactivity or secondary complications?. Unpublished 2003.

Lennihan 2003 ***{published data only}***
Lennihan L, Wootten ME, Wainwright M, Tenteromano L, McMahon D, Cotier J. Treadmill with partial body-weight support versus conventional gait training after stroke. *Archives of Physical Medicine and Rehabilitation* 2003;**84**(9):E5. [: Abstract 21:]

Lennon 2008 ***{published data only}***
Lennon O, Carey A, Gaffney N, Stephenson J, Blake C. A pilot randomized controlled trial to evaluate the benefit of the cardiac rehabilitation paradigm for the non-acute ischaemic stroke population. *Clinical Rehabilitation* 2008;**22**:125–33.

Li 2005 ***{published data only}***
* Li LSW, Tong RKY, Ng MFW, So EFM. Gait training by mechanical gait trainer and functional electrical stimulation for subacute stroke patients: a randomised controlled study. Proceedings of 3rd World Congress of the International Society of Physical and Rehabilitation Medicine - ISPRM. Sao Paulo, 2005.
Ng MFW, Tong RKY, Li LSW. A pilot study of randomized clinical controlled trial of gait training in subacute stroke patients with partial body-weight support electromechanical gait trainer and functional electrical stimulation. Six-month follow-up. *Stroke* 2008;**39**:154–60.
Tong RKY, Ng MFW, Li LSW. The effect of electromechanical gait trainer combined with functional electrical stimulation for subacute stroke rehabilitation. *International Journal of Stroke* 2008;**3 Suppl 1**:357.

Liang 2005 ***{published data only}***
Liang SQ, Peng XS, Yang JH. Two-stage rehabilitative training in the recovery of walking ability in stroke patients with hemiplegia. *Chinese Journal of Clinical Rehabilitation* 2005;**9**(21):8–9.

Liao 2006 ***{published data only}***
Liao L, Luo W, Chen S. The effect of trunk control training on balance and lower limb function in patients with hemiplegia. *Chinese Journal of Rehabilitation Medicine* 2006;**21**(7):608-9 and 616.

Lu 2002 ***{published data only}***
Lu S-Q. Effect of early rehabilitation training on the functional recovery in patients with acute stroke. *Chinese Journal of Clinical Rehabilitation* 2002;**6**(17):2626–7.

MacKay-Lyons 2008 ***{published data only}***
MacKay-Lyons MJ, McDonald A, Matheson J, Howlett J. Physiological changes following a 12-week program of body-weight supported treadmill training early post-stroke: a randomized clinical trial. *International Journal of Stroke* 2008;**3 Suppl 1**:348.

Macko 2007 ***{published data only}***
Forrester LW, Hanley DF, Macko RF. Effects of treadmill exercise on transcranial magnetic stimulation-induced excitability to quadriceps after stroke. *Archives of Physical Medicine and Rehabilitation* 2006;**87**:229–34.
Ivey FM, Ryan AS, Hafer-Macko CE, Goldberg AP, Macko RF. Treadmill aerobic training improves glucose tolerance and indices of insulin sensitivity in disabled stroke survivors. A preliminary report. *Stroke* 2007;**38**:2752–8.
Luft AR, Macko RF, Forrester LW, Villagra F, Ivey F, Sorkin JD. Treadmill exercise activates subcortical neural networks and improves walking after stroke: a randomized controlled trial. *Stroke* 2008;**39**:3341–50.
* Michael K, Macko RF. Ambulatory activity intensity profiles, fitness and fatigue in chronic stroke. *Topics in Stroke Rehabilitation* 2007;**14**(2):5–12.

Marsden 2008 ***{published data only}***
Marsden J, Gibson LM, Lightbody CE, Sharma AK, Siddiqi M, Watkins C. Can early onset bone loss be effectively managed in post-stroke patients? An integrative review of the evidence. *Age and Ageing* 2008;**37**:142–50.

McClellan 2004a ***{published data only}***
McClellan R, Ada L. Efficacy of a resource-efficient exercise program in reducing disability and handicap in stroke survivors: a randomised controlled clinical trial. *Internal Medicine Journal* 2004;**34**(1-2):A11.

McMeeken 1999 ***{published data only}***
McMeeken J, Kent P, Baker P, Keating J. Effects of a lower limb strengthening program during rehabilitation after stroke. 13th International Congress of the World Confederation of Physical Therapy May 23rd -28th 1999. Japan, Yokohama: World Confederation of Physical Therapy, 1999:135. [: Abstract: PL–RR–271–27B]

Mehrberg 2001 ***{published data only}***
Mehrberg RD, Flick C, Dervay J, Carmody J, Carrington C, Jermer M. Clinical evaluation of a new over ground partial body weight support assistive device in hemiparetic stroke patients. *Archives of Physical Medicine and Rehabilitation* 2001;**82**:1293.

Mehrholz 2008 ***{published data only}***
Mehrholz J, Werner C, Kugler J, Pohl M. Electro-mechanical-assisted gait training with physiotherapy may improve walking after stroke. *Stroke* 2008;**39**:1929–30.

Nadeau 2002 ***{published data only}***
Nadeau S, Milot MH, Requiao LF, Gravel D, Bourbonnais D. An explanatory model to study the effects of changes in muscle strength in response to training on gait performance in adults with stroke. *Gait and Posture* 2002;**16 Suppl 1**:S168–S169.

Ottowa Panel 2006 *{published data only}*

The Ottowa Panel. Ottawa Panel evidence-based clinical practice guidelines for post-stroke rehabilitation. *Topics in Stroke Rehabilitation* 2006;**13**(2):1–269.

Pollock 2007 *{published data only}*

* Pollock A, Baer G, Langhorne P, Pomeroy V. Physiotherapy treatment approaches for the recovery of postural control and lower limb function following stroke: a systematic review. *Clinical Rehabilitation* 2007;**21**:395–410.

Pollock A, Baer GD, Langhorne P, Pomeroy VM. Physiotherapy treatment approaches for stroke. *Stroke* 2008;**39**:519–20.

Richards 2006 *{published data only}*

Richards CL, Malouin F, McFadyen BJ, Comeau F, Fung J, Lamontagne J. A virtual reality-based program for locomotor training after stroke. Stroke Rehab 2006. Evidence for Stroke Rehabilitation - Bridging into the Future. Goteborg, 2006.

Rimmer 2004 *{published data only}*

Rimmer J, Wang E. The dose-response effects on aerobic exercise in stroke survivors. *Archives of Physical Medicine and Rehabilitation* 2004;**85**:E2.

Sherrington 2008 *{published data only}*

Pamphlett P, Nugent J, Sherrington C, Jacka J, Olivetti L, Hall J, et al.Task-related circuit classes for people with movement difficulties. Unpublished 2004.

Sherrington C, Pamphlett P, Jacka J, Olivetti L, Nugent J, Hall J. A randomised controlled trial to evaluate task-related exercise classes for older people with impaired mobility. *Australian Journal of Physiotherapy* 2005;**51**(4 e-Suppl):S31–2.

* Sherrington C, Pamphlett PI, Jacka JA, Olivetti LM, Nugent JA, Hall JM ea. Group exercise can improve participants' mobility in an outpatient rehabilitation setting: a randomized controlled trial. *Clinical Rehabilitation* 2008;**22**:493–502.

Shintani 2005 *{published data only}*

Shintani M, Nagai S, Shimoda S, Wada Y, Sonoda S. High-speed treadmill exercise for stroke hemiplegics. Proceedings of the 3rd World Congress of the International Society of Physical and Rehabilitation Medicine ISPRM. 2005:91–94.

Sianni 2008 *{published data only}*

Sianni A, Ganotopoulou A, Kosma K, Liatsos K, Laskos E, Karagianni N, et al.The benefiting effect of exercise after an acute cerebrovascular stroke (ACVS). *International Journal of Stroke* 2008; **3 Suppl 1**:468.

Sims 2009 *{published data only}*

Sims J. Regenerate: a strength training program to enhance the physical and mental health of chronic post stroke patients with depression. Unpublished 2005.

* Sims J, Galea M, Taylor N, Dodd K, Jespersen S, Joubert L, et al.Regenerate: assessing the feasibility of a strength-training program to enhance the physical and mental health of chronic post stroke patients with depression. *International Journal of Geriatric Psychiatry* 2009;**24**(1):76–83.

Skvortsova 2008 *{published data only}*

Skvortsova VI, Ivanova GE, Kovrazhkina EA, Rumyantseva NA, Staritsin AN, Sogomonyan EK. The efficacy of gait rehabilitation after stroke training with assistance of a robotic device gait trainer: a pilot study. *International Journal of Stroke* 2008;**3 Suppl 3**:355.

Srivastava 2008 *{published data only}*

Srivastava A, Gupta A, Taly AB, Kumar S, Murali T. Role of body weight supported treadmill training in retraining gait after stroke: randomized controlled study. *International Journal of Stroke* 2008;**3 Suppl 1**:356.

STATT 2008 *{published data only}*

* Baer G. Treadmill training and sub-acute stroke: a phase II feasibility study. 3rd UK Stroke Forum Conference 2008. Harrogate, 2008.

STATT Triallists Collaboration. Treadmill training in sub-acute stroke: report of an ongoing phase II feasibility study of a complex intervention. UK Stroke Forum Conference 2007. Harrogate, UK, 2007.

Stewart 2005 *{published data only}*

Stewart KC, Cauraugh JH. Bilateral movements as a stroke rehabilitation protocol for the upper extremity: a meta-analysis. *Journal of Sport & Exercise Psychology* 2005;**27 Suppl**:S147.

Verheyden 2007 *{published data only}*

Verheyden G, Vereeck L, Truijen S, De Weerdt W. Additional exercises improve trunk performance after stroke: an assessor-blinded randomized controlled trial. UK Stroke Forum Conference 2007. Harrogate, 2007.

Verschueren 2007 *{published data only}*

Verschueren SM, Bogaerts A, Feys H. Effects of whole body vibration training in chronic stroke patients: a randomized controlled pilot study. ISPGR 2007. 18th International Conference of the International Society for Posture and Gait Research. Vermont, 2007.

Weng 2004 *{published data only}*

Weng C, Bi S, Tian Z, Yu Z, Xu J, Bi S, et al.Application of structured speed-dependent treadmill training in hemiplegic patients after stroke. *Chinese Journal of Clinical Rehabilitation* 2004;**8**(34):7617–9.

Wolff *{published data only}*

Wolff D, Kerkovitch DM. Effects of strength training on upper-limb function in post-stroke hemiparesis. http://clinicaltrials.gov/. [: NCT00037908]

Yen 2008 *{published data only}*

Yen CL, Wang RY, Liao KK, Huang CC, Yang YR. Gait training-induced change in corticomotor excitability in patients with chronic stroke. *Neurorehabilitation and Neural Repair* 2008;**22**:22–30.

Yu 1996 *{published data only}*

Yu WH, Nie YJ, Zhang DY. An analysis of early recovery through physical therapy in 60 hemiplegia patients caused by cerebral apoplexy. *Chinese Journal of Practical Internal Medicine* 1996;**16**(5): 287–8.

Zhu 2007 *{published data only}*

Zhu L, Liu L, Song W-Q. Curative effect observation of repetitive training in improving hemiplegic upper extremity spasticity in patients with stroke. *Chinese Journal of Cerebrovascular Diseases* 2007;**4**(1):18–21.

References to ongoing studies

AMBULATE *{published data only}*

Ada L. 2 months versus 4 months of walking training to improve community ambulation after stroke. www.anzctr.au 2007.

Askim *{published data only}*
Askim T, Indredavik B. Does intensive task specific training improve balance after acute stroke?. ClinicalTrials.gov 2004.

Brissot *{published data only}*
Brissot R, Laviolle B. Efficacy of a mechanical gait repetitive training technique in hemiparetic stroke patients. ClinicalTrials.gov 2006.

Eng *{published data only}*
Eng, J. The effect of additional arm therapy on arm function after stroke. ClinicalTrials.gov 2006.

ExStroke *{published data only}*
Boysen, G. ExStroke Pilot Trial: physical exercise after acute ischaemic stroke. ClinicalTrials.gov 2003.
Boysen G, Krarup LH, Zeng X, Oskedra A, Korv J, Andersen G. Failure to promote physical activity after ischaemic stroke. The ExStroke Pilot Trial. *International Journal of Stroke* 2008;**3 Suppl 1**:72.
* Krarup LH, Gluud C, Truelsen T, Pedersen A, Lindahl M, Hansen L. The ExStroke Pilot Trial: rationale, design, and baseline data of a randomized multicenter trial comparing physical training versus usual care after an ischemic stroke. *Contemporary Clinical Trials* 2008;**29**:410–7.
Krarup LH, Truelsen T, Boysen G. Repeated encouragement to be physically active improves insulin sensitivity after ischemic stroke. *Cerebrovascular Diseases* 2008;**25 Suppl 2**:7.
Krarup LH, Truelsen T, Gluud C, Andersen G, Zeng X, Korv J. Prestroke physical activity is associated with severity and long-term outcome from first-ever stroke. *Neurology* 2008;**71**:1313–8.

FAME *{published data only}*
Stokes E, Cusack T. A randomised controlled trial of FAmily Mediated Exercises (FAME) following stroke. ClinicalTrials.gov 2008.

Kilbreath *{published data only}*
Kilbreath S. PBWST (partial body-weight supported treadmill training) and muscle power training after sub-acute stroke. ClinicalTrials.gov 2005.

Kuys *{published data only}*
Kuys S. Treadmill walking to improve walking and fitness following stroke: a single blinded pilot randomised controlled trial. www.aznctr.au 2007.
* Kuys SS, Brauer SG, Ada L. Treadmill training to improve walking following stroke: a randomised controlled trial. *International Journal of Stroke* 2008;**3 Suppl 1**:347.

Luft *{unpublished data only}*
Luft, A. Structural neuroplasticity associated with aerobic treadmill training in geriatric chronic stroke survivors. ClinicalTrials.gov 2008.

Mudge *{published data only}*
Mudge S. The impact of a group exercise programme on usual walking performance in adults who are at least 6 months post stroke: a single blinded randomised controlled trial. www.anzctr.au 2007. [: ACTRN1260700008141]

Olsson *{published data only (unpublished sought but not used)}*
Olsson E, Wester P, Nyberg L. Evaluation of an intervention program targeted at improving balance and functional skills after stroke. http://www.controlled-trials.com/mrct. [: NCT00377689]

Patten *{published and unpublished data}*
Patten C, Dozono J, Schmidt SG, Jue ME, Lum PS. Combined functional task practice and dynamic high intensity resistance training promotes recovery of upper-extremity motor function in post-stroke hemiparesis: a case study. *Journal of Neurologic Physical Therapy* 2006;**30**(3):99–115.

Pomeroy *{published data only}*
Cooke E, Pomeroy VM, Miller S, Tallis RC. The effects of functional strength training on lower limb strength and function after stroke. *Cerebrovascular Diseases* 2006;**21 Suppl 4**:104.
Cooke E, Tallis R, Miller S, Pomeroy V. The effects of functional strength training on lower limb strength and function after stroke. UK Stroke Forum Conference. Harrogate, 2006.
* Cooke EV, Tallis RC, Miller S, Pomeroy VM. The effects of functional strength training on lower limb strength and function after stroke. *Cerebrovascular Diseases* 2008;**25 Suppl 2**:45–6.
Cooke EV, Tallis RC, Miller S, Pomeroy VM. The effects of type and intensity of physiotherapy on lower limb strength and function after stroke. *Cerebrovascular Diseases* 2007;**23 Suppl 2**:129.

Protas *{unpublished data only}*
Lim P. Stroke rehabilitation outcomes with supported treadmill ambulation training. ClinicalTrials.gov 2006.

Quaney *{published data only}*
Quaney B. The effect of aerobic exercise on learning after stroke. ClinicalTrials.gov 2005.

REHAB *{published data only}*
Shaughnessy M. Reshaping Exercise Habits And Beliefs (REHAB). ClinicalTrials.gov 2007.

SIRROWS *{published data only}*
Dobkin B. Walking study for stroke rehabilitation. ClinicalTrials.gov 2007.

Suskin 2007 *{published data only}*
Suskin NG. Cardiac Rehabilitation for TIA patients (CR-TIA). ClincalTrials.gov 2007.

Tanne *{published data only}*
Tanne D. Early aerobic training program after ischemic stroke. ClinicalTrials.gov 2005.

Additional references

ACSM 1998
American College of Sports Medicine. The recommended quantity and quality of exercise for developing and maintaining cardiorespiratory and muscular fitness, and flexibility in healthy adults. *Medicine and Science in Sports and Exercise* 1998;**30**(6): 975–91.

Ada 2006
Ada L, Dorsch S, Canning CG. Strengthening interventions increase strength and improve activity after stroke: a systematic review. *Australian Journal of Physiotherapy* 2006;**52**(4):241–8.

Ada 2007
Ada L, Dorsch S, Canning C. Is strength training after stroke worthwhile?. *Stroke* 2007;**38**(2):571.

Andersen 2001
Andersen HE, Jurgensen KS, Boysen G. Intervention for apoplexy patients discharged from hospital. Physical training: a literature review. *Ugeskrift for Laeger* 2001;**163**(9):1255–9.

Andrews 2000
Williams Andrews A, Bohannon RW. Distribution of muscle strength impairments following stroke. *Clinical Rehabilitation* 2000;**14**:79–87.

Appell 1990
Appell H-J. Muscular atrophy following immobilisation. *Sports Medicine* 1990;**10**:42–58.

Barreca 2003
Barreca S, Wolf SL, Fasoli S, Bohannon R. Treatment interventions for the paretic upper limb of stroke survivors: a critical review. *Neurorehabilitation & Neural Repair* 2003;**17**(4):220–6.

Booth 2000
Booth FW, Gordon SE, Carlson CJ, Hamilton MT. Waging war on modern chronic diseases: primary prevention through exercise biology. *Journal of Applied Physiology* 2000;**88**:774–87.

Buchner 1991
Buchner DM, De Lateur BJ. The importance of skeletal muscle strength to physical function in older adults. *Annals of Behavioral Medicine* 1991;**13**(3):91–8.

Dawes 2005
Dawes H, Smith C, Collett J, Wade D, Howells K, Ramsbottom R, et al.A pilot study to investigate explosive leg extensor power and walking performance after stroke. *Journal of Sports Science and Medicine* 2005;**4**:556–62.

Eng 2002
Eng JJ, Kim CM, Macintyre DL. Reliability of lower extremity strength measures in persons with chronic stroke. *Archives of Physical Medicine and Rehabilitation* 2002;**83**(3):322–8.

Eng 2004
Eng JJ. Strength training in individuals with stroke. *Physiotherapy Canada* 2004;**56**:189–201.

Ernst 1990
Ernst E. A review of stroke rehabilitation and physiotherapy. *Stroke* 1990;**21**(7):1081–5.

Evans 2000
Evans WJ. Exercise strategies should be designed to increase muscle power. *Journals of Gerontology Series A: Biological Sciences & Medical Sciences* 2000;**55**(6):M309–M310.

Flansbjer 2005
Flansbjer UB, Holmbäck AM, Downham D, Patten C, Lexell J. Reliability of gait performance tests in men and women with hemiparesis after stroke. *Journal of Rehabilitation Medicine* 2005;**37**(2):75–82.

Fried 1996
Fried LP, Bandeen-Roche K, Williamson JD, Prasada-Rao P, Chee E, Tepper S, et al.Functional decline in older adults: expanding methods of ascertainment. *Journals of Gerontology Series A-Biological Sciences & Medical Sciences* 1996;**51**(5):M206–M214.

Frontera 1999
Frontera WL, Dawson DM, Slovik DM. *Exercise in Rehabilitation Medicine*. 1st Edition. Champaign IL: Human Kinetics, 1999.

Giuliani 1995
Giuliani C. Strength training for patients with neurological disorders. *Neurology Report* 1995;**19**:29–34.

Goldberg 1988
Goldberg G, Berger GC. Secondary prevention of stroke: a primary rehabilitation concern. *Archives of Physical Medicine and Rehabilitation* 1988;**69**:32–40.

Greener 2002
Greener J, Langhorne P. Systematic reviews in rehabilitation for stroke: issues and approaches to addressing them. *Clinical Rehabilitation* 2002;**16**(1):69–74.

Hall 1996
Hall K, Mann NR, Wright JM, Kreutzer JS, Wood D. Functional measures after traumatic brain injury: ceiling effects of FIM, FIM+FAM, DRS, and CIQ. *Journal of Head Trauma Rehabilitation* 1996;**11**:27–39.

Harridge 2000
Harridge SDR, Young A. Strength and power. In: Evans JG, Wiiliams TF, Beattie BL, Michel JP, Wilcock GK editor(s). *Oxford Textbook of Geriatric Medicine*. 2nd Edition. Oxford: Oxford University Press, 2000:963–8.

Hash 1978
Hash D. Energetics of wheelchair propulsion and walking in stroke patients. *Orthopedic Clinics of North America* 1978;**9**(2):372–4.

Hiraoka 2001
Hiraoka K. Rehabilitation effort to improve upper extremity function in post-stroke patients: a meta-analysis. *Journal of Physical Therapy Science* 2001;**13**(1):5–9.

Hobart 2002
Hobart JC, Williams LS, Moran K, Thompson AJ. Quality of life measurement after stroke: uses and abuses of the SF-36. *Stroke* 2002;**33**(5):1348–56.

Jadad 1996
Jadad AR, Moore RA, Carroll D. Assessing the quality of reports of randomized clinical trials: is blinding necessary?. *Controlled Clinical Trials* 1996;**17**:1–12.

Johnson 1999
Johnson EM. Has SF-36's role physical measure fallen short?. *Journal of Public Health Medicine* 1999;**21**(2):234.

Jolliffe 2002
Jolliffe JA, Rees K, Taylor RS, Thompson D, Oldridge N, Ebrahim S. Exercise-based rehabilitation for coronary heart disease. *Cochrane Database of Systematic Reviews* 2002, Issue 4. [Art. No.: CD001800. DOI: 10.1002/14651858.CD001800]

Keysor 2001
Keysor JJ, Jette AM. Have we oversold the benefit of late-life exercise?. *Journals of Gerontology Series A: Biological Sciences and Medical Sciences* 2001;**56**(7):M412–M423.

Kurl 2003
Kurl S, Laukkanen JA, Rauramaa R, Lakka TA, Sivenius J, Salonen JT. Cardiorespiratory fitness and the risk for stroke in men. *Archives of Internal Medicine* 2003;**163**(14):1682–8.

Kwakkel 2002
Kwakkel G, Kollen BJ, Wagenaar RC. Long term effects of intensity of upper and lower limb training after stroke: a randomised trial. *Journal of Neurology Neurosurgery & Psychiatry* 2002;**72**(4):473–9.

Kwakkel 2004
Kwakkel G, van Peppen R, Wagenaar RC, Wood Dauphinee S, Richards C, Ashburn A, et al.Effects of augmented exercise therapy time after stroke: a meta-analysis. *Stroke* 2004;**35**(11):2529–39.

Langhorne 2002
Langhorne P. Intensity of rehabilitation: some answers and more questions?. *Journal of Neurology Neurosurgery & Psychiatry* 2002;**72**(4):430–1.

Lee 2002
Lee CD, Blair SN. Cardiorespiratory fitness and stroke mortality in men. *Medicine & Science in Sports & Exercise* 2002;**34**(4):592–5.

Lee 2003
Lee CD, Folsom AR, Blair SN. Physical activity and stroke risk: a meta-analysis. *Stroke* 2003;**34**(10):2475–81.

Lindley 1994
Lindley R, Waddell F, Livingstone M. Can simple questions assess outcome after stroke?. *Cerebrovascular Diseases* 1994;**4**:314–24.

Liu 1999
Liu M, Tsuji T, Higuchi Y, Domen K, Tsujiuchi K, Chino N. Osteoporosis in hemiplegic stroke patients as studied with dual-energy X-ray absorptiometry. *Archives of Physical Medicine and Rehabilitation* 1999;**80**:1219–26.

MacDougall 1977
MacDougall JD, Ward GR, Sale DG, Sutton JR. Biochemical adaptation of human skeletal muscle to heavy resistance training and immobilization. *Journal of Applied Physiology: Respiratory Environmental & Exercise Physiology* 1977;**43**(4):700–3.

Macko 1997
Macko RF, DeSouza CA, Tretter LD, Silver KH, Smith GV, Anderson PA, et al.Treadmill aerobic exercise training reduces the energy expenditure and cardiovascular demands of hemiparetic gait in chronic stroke patients - a preliminary report. *Stroke* 1997;**28**(2):326–30.

Macko 2001
Macko RF, Smith GV, Dobrovolny CL, Sorkin JD, Goldberg AP, Silver KH. Treadmill training improves fitness reserve in chronic stroke patients. *Archives of Physical Medicine & Rehabilitation* 2001;**82**(7):879–84.

Malbut-Shennan 2000
Malbut-Shennan KE, Greig C, Young A. Aerobic exercise. In: Evans JG, Williams BL, Beattie BL, Michel JP, Wilcock GK editor (s). *Oxford Textbook of Geriatric Medicine*. 2nd Edition. Oxford: Oxford University Press, 2000.

Manning 2003
Manning CD, Pomeroy VM. Effectiveness of treadmill retraining on gait of hemiparetic stroke patients: systematic review of current evidence. *Physiotherapy* 2003;**89**(6):337–49.

Meek 2003
Meek C, Pollock A, Potter J, Langhorne P. A systematic review of exercise trials post stroke. *Clinical Rehabilitation* 2003;**17**(1):6–13.

Michael 2007
Michael K, Macko RF. Ambulatory activity intensity profiles, fitness, and fatigue in chronic stroke. *Topics in Stroke Rehabilitation* 2007;**14**(2):5–12.

Morris 2004
Morris SL, Dodd KJ, Morris ME. Outcomes of progressive resistance strength training following stroke: a systematic review. *Clinical Rehabilitation* 2004;**18**(1):27–39.

Moseley 2005
Moseley AM, Stark A, Cameron ID, Pollock A. Treadmill training and body weight support for walking after stroke. *Cochrane Database of Systematic Reviews* 2005, Issue 2. [Art. No.: CD002840. DOI: 10.1002/14651858.CD002840.pub2]

Pang 2006a
Pang MYC, Eng JJ, Dawson AS, Gylfadóttir S. The use of aerobic exercise training in improving aerobic capacity in individuals with stroke: a meta-analysis. *Clinical Rehabilitation* 2006;**20**(2):97–111.

Patterson 2007
Patterson SL, Forrester LW, Rodgers MM, Ryan AS, Ivey FM, Sorkin JD, et al.Determinants of walking function after stroke: differences by deficit severity. *Archives of Physical Medicine & Rehabilitation* 2007;**88**(1):115–9.

Potempa 1996
Potempa K, Braun LT, Tinknell T, Popovich J. Benefits of aerobic exercise after stroke. *Sports Medicine* 1996;**21**(5):337–46.

Puthoff 2007
Puthoff ML, Nielsen DH. Relationships among impairments in lower-extremity strength and power, functional limitations, and disability in older adults. *Physical Therapy* 2007;**87**(10):1334–47.

Ramas 2007
Ramas J, Courbon A, Roche F, Bethoux F, Calmels P. Effect of training programs and exercise in adult stroke patients: literature review. *Annales de Readaptation et de Medecine Physique* 2007;**50**(6):438–44.

Rantanen 2001
Rantanen T, Guralnik JM, Ferrucci L, Penninx BWJH, Leveille S, Sipila S, et al.Coimpairments as predictors of severe walking disability in older women. *Journal of the American Geriatrics Society* 2001;**49**(1):21–7.

RevMan 2008
The Nordic Cochrane Centre. The Cochrane Collaboration. Review Manager (RevMan). 5.0. Copenhagen: The Nordic Cochrane Centre. The Cochrane Collaboration, 2008.

Roche 1996
Roche AF, Heymsfield SB, Lohman TG. *Human Body Composition*. Champaign IL: Human Kinetics, 1996.

Saltin 1968
Saltin B, Blomqvist G, Mitchell JH, Johnson RL Jr, Wildenthal K, Chapman CB. Response to submaximal and maximal exercise after bed rest and training. *Circulation* 1968;**38 Suppl 7**:1–78.

Saltin 1980
Saltin B, Rowell LB. Functional adaptations to physical activity and inactivity. *Federation Proceedings* 1980;**39**(5):1506–13.

Saunders 2008
Saunders DH, Greig CA, Young A, Mead GE. Association of activity limitations and lower-limb explosive extensor power in ambulatory people with stroke. *Archives of Physical Medicine & Rehabilitation* 2008;**89**(4):677–83.

Shvartz 1990
Shvartz E, Reibold RC. Aerobic fitness norms for males and females aged 6 to 75 years: a review. *Aviation Space & Environmental Medicine* 1990;**61**(1):3–11.

Skelton 1999
Skelton D, Young A, Walker A, Hoinville E. In: Health Education Authority, editor(s). *Physical activity in later life: further analysis of the Allied Dunbar National Fitness Survey*. Cambridge: University Press, 1999.

Urton 2007
Urton ML, Kohia M, Davis J, Neill MR. Systematic literature review of treatment interventions for upper extremity hemiparesis following stroke. *Occupational Therapy International* 2007;**14**(1): 11–27.

USDHHS 1996
U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion. *Physical Activity and Health: A Report of the Surgeon General*. Atlanta: Centers for Disease Control and Prevention, 1996.

van de Port 2007
van de Port IGL, Wood-Dauphinee SPP, Lindeman EP, Kwakkel GP. Effects of exercise training programs on walking competency after stroke: a systematic review. *American Journal of Physical Medicine & Rehabilitation* 2007;**86**(11):935–51.

van der Lee 2001
van der Lee JH, Snels IA, Beckerman H, Lankhorst GJ, Wagenaar RC, Bouter LM. Exercise therapy for arm function in stroke patients: a systematic review of randomized controlled trials. *Clinical Rehabilitation* 2001;**15**(1):20–31.

Van Peppen 2004
Van Peppen RP, Kwakkel G, Wood-Dauphinee S, Hendriks HJ, Van der Wees PJ, Dekker J. The impact of physical therapy on functional outcomes after stroke: what's the evidence?. *Clinical Rehabilitation* 2004;**18**(8):833–62.

Wagenaar 1991
Wagenaar RC, Meijer OG. Effects of stroke rehabilitation (1). A critical review of the literature. *Journal of Rehabilitation Sciences* 1991;**4**(3):61–73.

Warlow 1996
Warlow CP, Dennis MS, van Gijn J, Hankey GJ, Sandercock PAG, Bamford JM, et al.*Stroke: A Practical Guide to Management*. 1st Edition. Oxford: Blackwell Science Ltd, 1996.

Waters 1999
Waters RL, Mulroy S. The energy expenditure of normal and pathological gait. *Gait and Posture* 1999;**9**:207–31.

Wendel-Vos 2004
Wendel-Vos GCW, Schuit AJ, Feskens EJM, Boshuizen HC, Verschuren WMM, Saris WHM, et al.Physical activity and stroke. A meta-analysis of observational data. *International Journal of Epidemiology* 2004;**33**(4):787–98.

Young 2001
Young A. For a healthier old age. In: Young A, Harries M editor(s). *Physical Activity for Patients: An Exercise Prescription*. London: Royal College of Physicians, 2001.

References to other published versions of this review

Saunders 2002
Saunders DH, Greig CA, Young A, Mead GE. Physical fitness training for acute stroke patients - a systematic review. *Cerebrovascular Diseases* 2002;**13**(Suppl 3):63.

Saunders 2004a
Saunders DH, Greig C, Young A, Mead G. Physical fitness training for stroke patients. *Cochrane Database of Systematic Reviews* 2004, Issue 1. [Art. No.: CD003316. DOI: 10.1002/14651858.CD003316.pub2]

Saunders 2004b
Saunders DH, Greig C, Young A, Mead G. Physical fitness training for stroke patients. *Stroke* 2004;**35**:2235.

* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

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

Bateman 2001

Methods	Design: training + usual care versus non-exercise intervention + usual care; 12-week follow up Randomisation: mechanism - computer; method - blocks size of 10 participants Allocation concealment: sealed envelopes Blinding: investigator blinded; participants encouraged to maintain blinding; efficacy unknown Intention to treat: yes; however, participants were excluded after recruitment and baseline assessments due to discharge Losses to follow up: intervention (12 participants: 4 before and 8 after the 12-week follow up); control (12 participants: 2 before and 10 after the 12-week follow up) Reasons unclear but included early discharge
Participants	Randomised: 84 participants Intervention: 40 participants; m/f 20/20; age 47.0 years ± 13.1 years; 144 ± 84 days post-stroke Control: 44 participants; m/f 29/14; age 50.3 years ± 10.1 years; 184 ± 127 day post-stroke Inclusion criteria: single stroke; could comply with planned interventions; could sit on a cycle ergometer Exclusion criteria: likely to be inpatient for < 3 months; impairments severe enough to limit training compliance and participation; cardiac disease; co-morbidities contraindicated for exercise
Interventions	Intervention: cardiorespiratory training; cycle ergometry at 60% to 80% of age-related heart rate maximum for up to 30 minutes/day 3 days/week for 12 weeks Control: relaxation - programme individualised: included breathing exercises, progressive muscle relaxation, autogenic exercises, visualisation techniques Setting: multicentre, 4 rehabilitation units
Outcomes	Included outcomes: FIM Instrument; Barthel Index (0 to 20 scale); Nottingham EADL; Rivermead Mobility Index; Hospital Anxiety and Depression Scale; Berg Balance scale; gait maximum speed; maximum cycling workload (data transformed to Log base e) Other outcomes: fatigue questionnaire; BMI
Notes	Mixed brain injury data provided by author; stroke-only data retained and re-analysed A lot of missing data items makes analysis of these data difficult

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	Sealed envelopes

Cuviello-Palmer 1988

Methods	Design: training + % usual care versus usual care; no follow up Randomisation: unknown Allocation concealment: unknown Blinding: unknown Intention-to-treat: no Losses to follow up: none
Participants	Randomised: 20 participants Intervention: 10 participants; m/f 6/4; age 69.5 years ± 14.1 years; 20.7 ± 13.2 days post-stroke Control: 10 participants; m/f 7/3; age 71.8 years ± 12.0 years; 12.0 ± 16.8 days post-stroke Inclusion criteria: unknown Exclusion criteria: unknown
Interventions	Intervention: cardiorespiratory training: isokinetic ergometer allowing resisted reciprocal leg movements (Kinetron II); commencing at 2 x 7 minutes/day for 5 days/week and 1 x 7 minutes/day for 1 day/week (total 6 days/week) for 3 weeks progressing to 10 minutes per session in week 2 and 12 minutes in week 3 Exercise intensity maintained at a heart rate of < 20 beats/minute above resting Control: usual care: 2 x 45 minutes/day for 5 days/week and 1 x 45 minutes/day for 1 day/week (total 6 days/week) for 3 weeks Gait training, mat exercises, and transfer training achieved via strengthening exercises, PNF, FES, Brunnstum, Rood and neurodevelopment techniques Setting: rehabilitation centre
Outcomes	Included outcomes: FIM Instrument (old version); gait speed preferred (7 seconds) Other outcomes: stance symmetry; contact time (seconds); stride cadence steps/minute and other biomechanical gait parameters
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	Not reported

da Cunha 2002

Methods	Design: training + % usual care versus usual care; no follow up Randomisation mechanism: random number table Allocation concealment: unknown Blinding: unknown Intention-to-treat: no Losses to follow up: none
Participants	Randomised: 15 participants Intervention: 7 participants; m/f 6/1; age 57.8 years ± 5.5 years; 15.7 ± 7.7 days post-stroke Control: 8 participants; m/f 7/1; age 58.9 years ± 12.9 years; 19.0 ± 12.7 days post-stroke Inclusion criteria: recent stroke (onset < 6 weeks); significant gait deficit (< 36 metres/minute; FAC score

da Cunha 2002 (*Continued*)

	of 0, 1 or 2); sufficient cognition to participate in training (MMSE ≥ 21); able to stand and take 1 or more steps without assistance Exclusion criteria: co-morbidity or disability other than hemiparesis; recent MI; any uncontrolled health condition; joint disease or rheumatoid arthritis; obesity (> 110 kg); cognitive impairment (MMSE < 21)
Interventions	Intervention: cardiorespiratory training: treadmill walking with body weight support 20 minutes/day 6 days/week for 2 to 3 weeks (until discharge); intensity unknown but rapid progression imposed by increasing speed and reducing body weight support; the 20-minute training replaced the 20-minute gait training component of the control Control: usual care 3 hours/day for 6 days/week for 2 to 3 weeks until discharge; included kinesiotherapy (1 hour/day), occupational therapy (1 hour/day) and physical therapy (1 hour/day): the physical therapist included 20 minutes of gait training comprising stepping, standing, turning, etc, but not continuous walking Setting: rehabilitation centre
Outcomes	Included outcomes: cycle performance work rate (Watts); VO_2peak; blood pressure; FAC; FIM (lower limb); gait speed maximal (5 metres); gait endurance (5 minutes); gait economy Other outcomes: stance symmetry; contact time (seconds); stride cadence steps/minute and other biomechanical gait parameters
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	Not reported

Dean 2000

Methods	Design: training versus non-exercise intervention; 2-month follow up Randomisation mechanism: drawing cards; method: pairs matched on walking speed Allocation concealment: n/a Blinding: investigator: for all except 1 outcome measure Outcome assessor unblinded on observing a group training session Intention-to-treat: no Losses to follow up: 4 participants (2 in the intervention group: 1 withdrew before training, 1 unavailable for follow up; 2 in the control group: 1 withdrew before training, 1 withdrew due to illness)
Participants	Randomised: 12 participants Intervention: 6 participants, 3 male; age 68.8 years ± 4.7 years; 1.3 ± 0.9 years post-stroke Control: 6 participants, 4 male; age 64.8 years ± 3.3 years; 2.1 ± 0.5 years post-stroke Inclusion criteria: first stroke resulting in hemiplegia; at least 3 months post-stroke; discharged from all usual rehabilitation; available to attend all training sessions; able to walk 10 metres with or without walking aids Exclusion criteria: no medical condition which would prevent fitness training

Dean 2000 (*Continued*)

Interventions	Intervention: mixed training: performed in a group for 60 minutes/day 3 days/week for 4 weeks, task-related lower limb circuit training comprising cardiorespiratory training (treadmill and graded walking) , strength training (stepping, raising and reaching), training intensity not quantified, but participants observed as being 'tired and sweaty' post-exercise Control: upper limb functional exercises, considered 'sham' lower limb training, performed in a group for 60 minutes/day 3 days/week for 4 weeks Setting: rehabilitation centre
Outcomes	Included outcomes: gait endurance (6-MWT, outcome assessor not blinded); gait preferred speed; 3-metre timed up-and-go; step test Other outcomes: peak vertical ground reaction force on sit to stand; grip strength (upper extremity); biomechanical analysis of gait, bi- and uni-manual Purdue Pegboard
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	Not reported

Duncan 1998

Methods	Design: training versus usual care (outpatient); no follow up Randomisation mechanism: unknown; method: blocks of 10 Allocation concealment: third-party involvement Blinding: unclear Intention-to-treat: yes Losses to follow up: none
Participants	Randomised: 20 participants Intervention: 10 participants; m/f unknown; age 67.3 years ± 9.6 years; 66 days post-stroke Control: 10 participants; m/f unknown; age 67.8 years ± 7.2 years; 56 days post-stroke Inclusion criteria: 30 to 90 days post-stroke; minimal/moderately impaired sensorimotor function; available to attend all training sessions; ambulatory with or without supervision or walking aids; living at home within 50 miles Exclusion criteria: medical condition which compromised outcome assessment or prevented fitness training; MMSE score < 18 or receptive aphasia
Interventions	Intervention: mixed training, performed approximately 90 minutes/day 3 days/week for 12 weeks (8 weeks supervised 1:1 with therapist, 4 weeks alone), functional exercises comprising assistive/resistive exercise, balance exercises, upper limb functional activities, walking or cycling; apart from some resisted exercise the training intensity was not quantified Control: usual outpatient care, physical and occupational therapy as advised by the patient's physician, averaging 44 minutes/day, 3.25 days/week for 12 weeks, therapeutic interventions were during home or outpatient visits and comprised balance training (60%), strength training (40%), bimanual activities (50%) and facilitative exercise (30%); cardiorespiratory training was not provided (0%) Setting: home-based, therapist-supervised for first 8 weeks

Duncan 1998 (*Continued*)

Outcomes	Included outcomes: Barthel Index; Lawton Instrumental ADL; gait endurance (6-MWT); Berg Balance Scale; Fugl Meyer (upper and lower extremity) Other outcomes: gait preferred speed (data lack variance measures), SF-36 (non-standard pooling of data) , Jebsen Hand Test
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	Third party

Duncan 2003

Methods	Design: training versus usual care (outpatient); 6-month follow up Randomisation mechanism: unknown; method: blocks of 6 Allocation concealment: sealed envelopes Blinding: investigator; participants asked to maintain blinding Intention-to-treat: yes Losses to follow up: intervention (10 participants: 6 before (1 renal insufficiency, 1 subclavian steal syndrome, 1 chose withdrawal, 3 recurrent stroke) 4 after the 3-months follow up (1 died, 1 hospital, 2 recurrent stroke)); control (11 participants: 2 before (1 withdrew, 1 non-return), 9 after 3-months follow up (2 died, 2 hospital, 5 withdrew))
Participants	Randomised: 100 participants Intervention: 50 participants; m/f 23/27; age 68.5 years ± 9.0 years; 77.5 ± 28.7 days post-stroke Control: 50 participants; m/f 27/23; age 70.2 years ± 11.4 years; 73.5 ± 27.1 days post-stroke Inclusion criteria: 30 to 150 days post-stroke; independent ambulation for 25 feet; Fugl-Meyer scores 27 to 90; Orpington Prognostic Scale 2.0 to 5.2); Folstein Mini-Mental State score 16 Exclusion criteria: serious cardiac condition; oxygen dependence; severe weight bearing pain; serious organ system disease; life expectancy < 1 year
Interventions	Intervention: mixed training, performed approximately 90 minutes/day 3 days/week for 12 to 14 weeks (36 sessions); training included range of motion and flexibility, strength training, balance, functional upper extremity practice, endurance training via interval training on cycle ergometer: all elements progressive but intensity not quantified Control: those who required it received usual outpatient care including physiotherapy and occupational therapy; all controls received 30-minute visit/2 weeks including provision of health promotion information Setting: home-based, therapist-supervised for first 8 weeks
Outcomes	Included outcomes: FIM cognitive and motor subscales; SF-36 subscales; ankle dorsiflexion and knee extension isometric strength (Nm); isometric grip strength (N); Fugl Meyer scores; Berg Balance Scale; Functional reach; VO_2peak; gait speed preferred (10-metre); 6-MWT; Community ambulation (> 0.8 metres/second) Other outcomes: Stroke impact scale; cycle duration

Duncan 2003 (*Continued*)

Notes	Some outcomes reported as change from baseline scores Others reported as means at end of 6-month follow up

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	Sealed envelopes

Eich 2004

Methods	Design: training + usual care versus usual care; 3-month follow up Randomisation mechanism: picking envelopes; method: restricted Allocation concealment: sealed envelopes Blinding: investigator; efficacy was compromised Intention-to-treat: yes Losses to follow up: intervention 1 participant (refusal) after the 6-week follow up
Participants	Randomised: 50 participants Intervention: 25 participants; male 17; age 62.4 years ± 4.8 years; 43 ± 15 days post-stroke Control: 25 participants; male 16; age 64 years ± 9 years; 44 ± 18 days post-stroke Inclusion criteria: aged 50 to 75 years; first stroke; time since stroke < 6 weeks; walk 12 metres with/without assistance; Barthel score 50 to 80; participating in 12-week comprehensive rehabilitation programme; stable cardiovascular responses; no non-stroke walking impairments; able to understand purpose and content of study
Interventions	Intervention: cardiorespiratory training, performed 30 minutes/day 5 days/week for 6 weeks; progressive treadmill training with either no or minimal support of bodyweight; intensity was 60% of heart rate reserve Control: both groups received usual care comprising individual physiotherapy based on Bobath concept plus occupational and speech therapy, and neuropsychology as required Setting: rehabilitation unit - inpatient care
Outcomes	Included outcomes: gait speed maximal (10-metres); gait endurance (6-MWT) Other outcomes: Rivermead motor assessment (non-normal data); walking quality scale (non-normal data)
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	Sealed envelopes

Glasser 1986

Methods	Design: training + % usual care versus usual care; no follow up Randomisation: unknown Allocation concealment: unknown Blinding: unknown Intention-to-treat: no Losses to follow up: none
Participants	Randomised: 20 participants Intervention: 10 participants; m/f 4/6 Control: 10 participants; m/f 6/4 All participants age 40 to 75 years and were 3 to 6 months post-stroke; all participants exhibited hemiparesis with upper and lower extremity motor dysfunction; some showed sensory deficits and mild expressive or receptive aphasia Inclusion criteria: unknown Exclusion criteria: unknown
Interventions	Intervention: cardiorespiratory training: isokinetic ergometer (Kinetron) training twice a day 5 days/week for 10 weeks; the intensity was maintained at 50 -100 psi and duration of each session progressed from 10 to 30 minutes over the first 5 weeks Control: therapeutic exercise and gait training 1 hour/session 2 sessions/day 5 days/week for 5 weeks Setting: physical therapy department
Outcomes	Included outcomes: gait speed maximal (6-metres) Other outcomes: Functional Ambulation Profile Score
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	Not reported

Inaba 1973

Methods	Design: training + usual care versus usual care; 2-month follow up Randomisation: unknown Allocation concealment: unknown Blinding: outcome assessor - unclear Intention-to-treat: no Losses to follow up: unclear: 101/177 patients lost to follow up across the control and both intervention groups; 54 patients completed the control versus strength training comparison; estimated dropouts approximately 60 One reason given for dropouts was discharge before end of the study
Participants	Randomised: 54 participants Intervention: 28 participants; m/f 11/17; age 55.6 years; < 3 months post-stroke Control: 26 participants; m/f 15/11; age 56.9 years; < 3 months post-stroke All participants had hemiparesis

Inaba 1973 (*Continued*)

	Inclusion criteria: hemiparesis arising from cerebrovasular accident secondary to thrombosis; embolus or haemorrhage; able to follow verbal or demonstrated directions; extend the involved lower limb against a load of 1.1 kg; independent ambulation Exclusion criteria: aetiology of aneurysm or trauma
Interventions	Intervention: strength training: progressive resistive exercise once per day for 4 to 8 weeks; extension of the affected lower limb from 90º to full-knee extension whilst in the supine position on an Elgin table (machine weights), 5 repetitions at 50% maximum weight, and 10 at maximum Control: usual care: conventional functional training, including stretching, 4 to 8 weeks until discharge Setting: rehabilitation centre
Outcomes	Included outcomes: leg strength (10 repetition maximum) lacked variance measures number of participants able to perform 10 ADL
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	Not reported

James 2002

Methods	Design: training versus no intervention; no follow up Randomisation mechanism: computer; method: blocks of 4 Allocation concealment: sealed envelopes Blinding: investigator Intention-to-treat: yes Losses to follow up: control group 2 dropped out (neurological problems)
Participants	Randomised: 20 participants Intervention: 10 participants; m/f 4/6; age 76.1 years ± 12.33 years; 1826 ± ?days post-stroke Control: 10 participants; m/f 2/8; age 80.8 years ± 9.0 years; 1845 ± ?days post-stroke Inclusion criteria: stroke with hemiplegia; ability to give informed consent Exclusion criteria: no complicating medical history (cardiac, pulmonary or neurological); no severe deficits in communication, memory or understanding; no painful orthopaedic conditions which could limit participation
Interventions	Intervention: mixed training, performed 90 to 120 minutes/day 3 days/week for 4 weeks Warm up followed by half squats; chair squats; small knee bends; standing on affected leg; single-leg half squat on affected leg; standing on unaffected leg and bending affected hip and knee; stair stepping; stepping on spot; walking indoors and outdoors; stepping forwards, backwards and sideways; opening and closing doors; walking and placing/lifting objects; placing objects on shelves Finished with a cool down; progression achieved increasing pulse rate from 50% (first 2 weeks) to 60% (last 2 weeks) of HRR, increasing total distance walked, and increasing step height and repetition number Control: no intervention Setting: patients' homes

James 2002 (*Continued*)

Outcomes	Included outcomes: gait speed preferred (5-metre with mixed surfaces and a dead turn at 2.5 metres) Other outcomes: functional walking ability questionnaire; upright motor control test; SF-36 - older version
Notes	Unpublished thesis

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	Sealed envelopes

Katz-Leurer 2003

Methods	Design: training + usual care versus usual care; follow up 6 months post stroke Randomisation mechanism: unknown; method: blocks based on side of lesion Allocation concealment: sealed envelopes Blinding: investigator; efficacy unknown Intention-to-treat: unknown Losses to follow up: intervention: no losses at end of intervention, 5 losses at 6-month follow up (4 not located, 1 died); control: 2 discontinued intervention (1 acute MI, 1 DVT), 6 losses to follow up (3 not located, 1 died, 2 recurrent stroke)
Participants	Randomised: 92 participants Intervention: 46 participants; m/f 26/20; age 62 years ± 11 years; time since stroke unknown Control: 46 participants; m/f 23/23; age 65 years ± 11 years; time since stroke unknown Inclusion criteria: age > 50 years; > 6 months after first ever stroke; walk 40 metres with +/- rest, +/- assistive device; ≥ stage 3 of Chedoke-McMaster Stroke Assessment: tolerate 45 minutes of exercise with rest intervals; non-participation in other therapy programmes Exclusion criteria: comprehensive aphasia; not medically stable; musculoskeletal problems not associated with stroke
Interventions	Intervention: cardiorespiratory training: cycle ergometer; 8-week programme: (1) 20 minutes/day 5 days/week for 2 weeks of intermittent (10 x 1 minute) exercise progressing to 20 minutes continuous exercise by end of week 2; (2) 30 minutes/day 3 days/week for 6 weeks not exceeding 60% HRR; ACSM cardiorespiratory training guidelines met Control: usual physiotherapy, occupational therapy, speech therapy and group activity/exercise Setting: rehabilitation centre
Outcomes	Included outcomes: FIM; blood pressure; maximum cycle workload (Watts); comfortable walking speed (10-metre) gait endurance; distance until fatigue; Frenchay activity index; stairs climbed Other outcomes: Scandinavian Stroke Scale
Notes	

Risk of bias

Item	Authors' judgement	Description

Allocation concealment?	Yes	Sealed envelopes

Kim 2001

Methods	Design: training versus non-exercise intervention; no follow up Randomisation mechanism: unknown; method: stratified based on sex (m/f), age (50 to 59 or 60+ years) and time since onset of stroke (6 months to 2 years/2+ years) Allocation concealment: unknown Blinding: investigator; participants blinded to purpose of interventions Intention-to-treat: unknown Losses to follow up: none
Participants	Randomised: 20 participants Intervention: 10 participants; m/f 7/3; age 60.4 years ± 9.5 years; 4.9 ± 3.3 years post-stroke Control: 10 participants; m/f 7/3; age 61.9 years ± 7.5 years; 3.2 ± 1.2 years post-stroke All participants had hemiparesis Inclusion criteria: age > 50 years; > 6 months after first ever stroke; walk 40 metres with +/- rest, +/- assistive device; ?stage 3 of Chedoke-McMaster Stroke Assessment; tolerate 45 minutes of exercise with rest intervals; non-participation in other therapy programmes Exclusion criteria: comprehensive aphasia; not medically stable; musculoskeletal problems not associated with stroke
Interventions	Intervention: strength training: isokinetic dynamometer (Kin-Com); 45 minutes/day 3 days/week for 6 weeks; after a warm up this comprised 30 minutes of 3 x 10 resisted repetitions of maximal effort concentric hip flexion/extension, knee flexion/extension and ankle dorsiflexion/plantarflexion of the affected lower limb; progression in the resistance was achieved by increasing the preload on the Kin-Com device; ACSM guidelines met Control: exactly the same as intervention except the resisted contractions replaced with passive range of motion movements Setting: rehabilitation centre
Outcomes	Included outcomes: gait preferred speed (metres/minute over 8 metres); gait maximum speed (metres/minute); stair climbing speed (stairs/second); composite strength score for the affected (trained) lower limb Other outcomes: stair walking performance (4 x 18 cm steps) self selected and maximal; SF-36 Physical and Mental Health Component Summary Scores; composite strength score for the affected (trained) lower limb
Notes	Data reported as change scores

Risk of bias

Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	Not reported

Mead 2007

Methods	Design: training versus non-exercise intervention; 4-month follow up Randomisation mechanism: internet application; minimisation dichotomised on sex; FIM score (120); age (70 years) Allocation concealment: n/a; sequence generation and allocation occurred simultaneously Blinding: investigator; participants encouraged to maintain blinding Intention-to-treat: yes Losses to follow up: intervention 0; control 4: 1 withdrew before intervention; 3 after end of intervention follow up (1 stroke-related illness, 1 fall, 1 recurrent stroke)
Participants	Randomised: 66 participants Intervention: 32 participants; m/f 18/14; age 72.0 years ± 10.4 years; median 171 (IQR 55 to 287) days post-stroke Control: 34 participants; m/f 18/16; age 71.7 years ± 9.6 years; median 147.5 (IQR 78.8 to 235.5) days post-stroke Inclusion criteria: independently ambulatory; living within central or south Edinburgh Exclusion criteria: dysphasia or confusion severe enough to prevent informed consent or impair safety in exercise classes; medical contraindications to exercise training
Interventions	Intervention: mixed training: group circuit training performed 40 to 75 minutes/day 3 days/week for 12 to 14 weeks (36 sessions); after a warm up the training comprised 2 components: (1) a cardiorespiratory circuit (cycle ergometry, raising and lowering an exercise ball, shuttle walking, standing chest press, and stair climbing and descending); (2) resistance training circuit (upper back exercise and tricep extension using Thera-Band, lifting a weighted pole, a sit-to-stand exercise); progression in duration, repetition number, speed, mass of objects and resistance of Thera-Band whilst maintaining an RPE (6 to 20 scale) of 13 to 60 Control: non-exercise intervention; seated relaxation involving deep breathing and progressive muscular relaxation; no muscle contractions were involved Setting: rehabilitation hospital
Outcomes	Included outcomes: FIM Instrument; Nottingham Extended ADL; Rivermead Mobility Index; functional reach; timed up-and-go; sit-to-stand time; SF-36 version 2; Hospital Anxiety and Depression Score; gait preferred speed; gait economy (VO_2 ml/kg/m); lower limb extensor explosive power (W/kg) Other outcomes: Elderly Mobility Scale (ceiling effect); FAC (ceiling effect)
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	Sequence generation and allocation occurred simultaneously

Ouellette 2004

Methods	Design: training versus non-exercise intervention; no follow up Randomisation: unknown Allocation concealment: unknown Blinding: investigator Intention-to-treat: yes Losses to follow up: intervention: 1 withdrawn (cardiac problem), 1 no follow up (hernia); control: 2 withdrew during intervention, 1 no follow up (abnormal ECG)
Participants	Randomised: 42 participants Intervention: 21 participants; m/f unknown; age 65.8 years ± 11.5 years; 968 ± 460 days post-stroke Control: 21 participants; m/f unknown; age 66.1 years ± 9.62 years; 779 ± 558 days post-stroke Inclusion criteria: age ≥ 50 years; 6 months to 6 years after single unilateral mild/moderate stroke with residual lower extremity hemiparesis; community dwelling; independently ambulatory +/- walking aids; report of ?2 limitations on the physical function subscale of the SF-36; ability to travel to the exercise laboratory; willing to be randomised
Interventions	Intervention: strength training: progressive resistive training of both lower limbs performed 3 days/week for 12 weeks comprising 3 sets of 8 to 10 repetitions at 70% of 1-RM; exercises were (1) seated bilateral leg press, and (2) unilateral knee extension, both using pneumatic resistance, and unilateral ankle; dorsiflexion; plantarflexion, both using weights; progression achieved via weekly assessment of 1-RM; warm up for each exercise was 4 repetitions of 25% 1-RM Control: non-exercise: bilateral range of motion and upper body flexibility exercises 3 days/week for 12 weeks Setting: exercise laboratory
Outcomes	Included outcomes: muscle strength (bilateral lower limb extension force); muscle strength (unilateral knee extension, ankle dorsiflexion and ankle plantarflexion); gait endurance (6-MWT), preferred speed (10 metres) and maximal speed (10 metres); chair rise time (5 repetitions); stair climb time (10 steps); late life function and disability instrument scale; SF-36 physical function subscale Other outcomes: muscle power - bilateral lower limb extension and unilateral knee extension; geriatric depression scale (data not reported); sickness impact profile; Ewarts self-efficacy scale
Notes	Variance reported as SE and converted to SD

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	Not reported

Pohl 2002a

Methods	Design: training + % usual care versus usual care; no follow up Randomisation mechanism: unknown; method: equal block based on gait speed Allocation concealment: unknown Blinding: investigator; efficacy unknown Intention-to-treat: no Losses to follow up: none
Participants	Randomised: 40 participants Intervention: 20 participants; m/f 14/16; age 57.1 years ± 13.9 years; 118 ± 144 days post-stroke Control: 20 participants; m/f 13/17; age 61.6 years ± 10.6 years; 113 ± 130 days post-stroke Inclusion criteria: left or right hemiparesis for > 4 weeks; impaired gait; no or slight abnormal muscle tone (Ashworth Score 0 and 1); walk without assistance (FAC = 3); 10-metre walk time > 5 seconds and < 60 seconds; class B exercise risk (ACSM 1998); absence of known heart disease; no evidence of heart failure, ischaemia or angina at rest or exercise; appropriate rise in systolic blood pressure and absence of ventricular tachycardia during exercise Exclusion criteria: revious treadmill training; class C or D exercise risk (ACSM 1998); cognitive deficits (MMSE < 26 of 30); movement disorders; orthopaedic or gait-influencing diseases
Interventions	Intervention: (1) cardiorespiratory training: treadmill walking (limited progression treadmill training); 30 minutes/day 3 days/week for 4 weeks; minimal (?10%) body weight support for first 3 sessions; speed progressed ?5% of maximum per week (20% over 4 weeks); gradient maintained at 0%; (2) conventional physiotherapy 45 minutes/day 2 days/week for 4 weeks (included some gait training); total 12 hours of treatment Control: conventional gait training 30 minutes/day 3 days/week for 4 weeks; comprised PNF and Bobath techniques; conventional physiotherapy 45 minutes/day 2 days/week for 4 weeks (included some gait training); total 15 hours of treatment Setting: rehabilitation centre
Outcomes	Included outcomes: gait maximum speed; FAC Other outcomes: stride cadence (steps/minute); stride length (metres)
Notes	For meta-analysis the control group (20 participants) is divided between the 2 comparisons of Pohl 2002a and Pohl 2002b to avoid exaggeration of overall participant numbers

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	Not reported

Pohl 2002b

Methods	Design: training + % usual care versus usual care; no follow up Randomisation mechanism: unknown; method: equal block based on gait speed Allocation concealment: unknown Blinding: investigator; efficacy unknown Intention-to-treat: no Losses to follow up: none
Participants	Randomised: 40 participants Intervention: 20 participants; m/f 16/4; age 58.2 years ± 10.5 years; 113 ± 115 days post-stroke Control: 20 participants; m/f 13/17; age 61.6 years ± 10.6 years; 113 ± 130 days post-stroke Inclusion criteria: left or right hemiparesis for > 4 weeks; impaired gait; no or slight abnormal muscle tone (Ashworth Score 0 and 1); walk without assistance (FAC = 3); 10-metre walk time > 5 seconds and < 60 seconds; class B exercise risk (ACSM 1998); absence of known heart disease; no evidence of heart failure, ischaemia or angina at rest or exercise; appropriate rise in systolic blood pressure and absence of ventricular tachycardia during exercise Exclusion criteria: previous treadmill training; class C or D exercise risk (ACSM 1998); cognitive deficits (MMSE < 26 of 30); movement disorders; orthopaedic or gait-influencing diseases
Interventions	Intervention: (1) cardiorespiratory training: treadmill walking (structured speed dependent treadmill training); 30 minutes/day 3 days/week for 4 weeks; minimal (?10%) body weight support for first 3 sessions; training sessions comprised repeated bouts increasing from 50% maximum up to maximum speed with rests between; speed progressed maximally at each training visit; gradient maintained at 0%, (2) conventional physiotherapy 45 minutes/day 2 days/week for 4 weeks (usual care, included some gait training), total 12 hours of treatment Control: (1) conventional gait training 30 minutes/day 3 days/week for 4 weeks: comprised PNF and Bobath techniques. (2) conventional physiotherapy 45 minutes/day 2 days/week for 4 weeks (included some gait training); total 15 hours of treatment Setting: rehabilitation centre
Outcomes	Included outcomes: gait maximum speed; FAC Other outcomes: stride cadence (steps/minute); stride length (metres)
Notes	For meta-analysis of FAC data an SD of 0.01 is inserted for the intervention group to avoid a value of zero For meta-analysis the control group (20 participants) is divided between the 2 comparisons of Pohl 2002a and Pohl 2002b to avoid exaggeration of overall participant numbers

Risk of bias

Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	Not reported

Pohl 2007

Methods	Design: training + % usual care versus usual care; follow up at 6 months Randomisation mechanism: picking envelopes; method: restricted randomisation Allocation concealment: sealed envelopes Blinding: investigator (only for Barthel Index and FAC); efficacy unknown Intention-to-treat: yes Losses to follow up: intervention: 13 losses to follow up: 5 at end of intervention (1 cardiovascular unstable, 1 tumour, 1 intra-cranial pressure, 2 refusals) rising to 13 at end of follow up (1 died, 6 moved, 6 refusals) ; control: 13 losses to follow up: 6 at end of intervention (1 died (MI), 1 MI, 4 refusals) rising to 13 at end of follow up (1 died (stroke), 1 moved, 11 refusals)
Participants	Randomised: 155 participants Intervention: 77 participants; m/f 50/27; age 62.3 years ± 12.0 years; 29.4 ± 12.6 days post-stroke Control: 78 participants; m/f 54/24; age 64.0 years ± 11.6 years; 31.5 ± 13.3 days post-stroke Inclusion criteria: first stroke; age 18 to 79 years; < 60 days since stroke; sit unsupported; non-ambulatory dependent on assistance for ambulation; understand the meaning of the study and follow instructions
Interventions	Intervention: cardiorespiratory training: body weight supported electromechanical gait trainer (Reha-Stim), performed 20 minutes/day 5 days/week for 4 weeks; 10% to 20% bodyweight support progressive unloading over programme and increase in number of steps taken plus individual physiotherapy based on Bobath concept performed 25 minutes/day 5 days/week for 4 weeks Control: individual physiotherapy based on Bobath concept; performed 45 minutes/day 5 days/week for 4 weeks Setting: rehabilitation hospital
Outcomes	Included outcomes: FAC; Barthel index; gait maximal speed (10-metre); gait endurance (6-MWT); Rivermead Mobility Index; Motricity Index
Notes	DEGAS Study: competing interest: the patent for the gait trainer device (Reha-Stim) is owned by the spouse of one of the authors (Hesse S)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	Sealed envelopes

Potempa 1995

Methods	Design: training versus non-exercise intervention; no follow up Randomisation: unknown Allocation concealment: unknown Blinding: unknown Intention-to-treat: no Losses to follow up: none
Participants	Randomised: 42 participants Intervention: 19 participants; m/f 8/11 Control: 23 participants; m/f 15/8

Potempa 1995 (*Continued*)

	All participants aged 43 to 70 years and were 216 ± 43 days post-stroke All participants had upper and lower limb hemiparesis Inclusion criteria: medically stable; at least 6 months post-stroke; completed formal rehabilitation Exclusion criteria: patients with brain stem lesions; any clinical evidence that would preclude maximal exercise testing
Interventions	Intervention: cardiorespiratory training: cycle ergometer training for 30 minutes/day 3 days/week for 10 weeks; intensity 30% to 50% of maximal effort increasing to maximum sustainable over first 4 weeks Control: non-exercise intervention: passive range of motion exercises for 30 minutes/day 3 days/week for 10 weeks Setting: unknown
Outcomes	Included outcomes: Fugl Meyer score; blood pressure; max cycling work rate (Watts) Other outcomes: body mass; heart rate at rest and during maximal exercise; RER and other respiratory variables; exercise duration
Notes	Variance reported as SEM and converted to SD

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	Not reported

Richards 1993

Methods	Design: training + usual care versus usual care; no follow up Randomisation mechanism: unknown; method: stratified on Barthel Index scores Allocation concealment: unknown Blinding: investigator; efficacy unknown Intention-to-treat: no Losses to follow up: control group 3 (1 refusal, 2 unknown)
Participants	Randomised: 18 participants Intervention: 10 participants; m/f 5/5; age 69.6 years ± 7.4 years; 8.3 ± 1.4 days post-stroke Control: 8 participants; m/f 2/6; age 67.3 years ± 11.2 years; 8.8 ± 1.5 days post-stroke Inclusion criteria: within 50 km of treatment center; men or women aged 40 to 80 years; 0 to 7 days after first stroke; middle cerebral artery syndrome identified by CT; under care of neurologist involved in study; willing to sign informed consent Exclusion criteria: other major medical conditions that would interfere with functional capacity or interfere with rehabilitation; patients who were independently ambulatory 1 week after stroke; patients who were unconscious at onset
Interventions	Intervention: mixed training: task-oriented gait training programme which used a tilt table, resisted exercises using a Kinetron, and treadmill walking, 104 minutes/day 5 days/week for 5 weeks; progression achieved via velocity and resistance (Kinetron) increments Control: traditional neurophysical techniques 109 minutes/day 5 days/week for 5 weeks Setting: hospital

Richards 1993 (*Continued*)

Outcomes	Included outcomes: Fugl-Meyer balance (FM-B); upper (FM-U) and lower (FM-L) extremity scores; Barthel Ambulation scores; Berg Balance; gait velocity
Notes	A second control group of early conventional therapy was not used for comparison since it differed from the institution's usual care; it commenced earlier than usual during hospital care and had substantially longer contact time

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	Not reported

Richards 2004

Methods	Design: training + % usual care versus usual care; 3-month follow up Randomisation mechanism: unknown; method: variable blocks stratified on time since stroke, disability, and age Allocation concealment: unknown Blinding: investigator; efficacy unknown Intention-to-treat: yes Losses to follow up: intervention: 8 (2 discontinued Intervention: 1 hip fracture, 1 cardiac problem), 5 unavailable for follow up; control: 8 (1 withdrew from intervention, 7 unavailable for follow up)
Participants	Randomised: 63 participants Intervention: 32 participants; m/f 22/10; age 62.9 years ± 12 years; 52 ± 22 days post-stroke Control: 31 participants; m/f 21/10; age 60.7 years ± 12 years; 52.8 ± 18 days post-stroke Inclusion criteria: first or second stroke; men or women aged 30 to 89 years; impaired walking; follow verbal instructions; Barthel ambulation score ?10; gait speed of 10 to 60 cm/second Exclusion criteria: cerebral and subarachnoid haemorrhage; major medical problems (cancer, heart conditions, diabetes); receptive or expressive aphasia; lower extremity musculoskeletal disorders affecting gait
Interventions	Intervention: mixed training: task-oriented gait training programme which used a limb-load monitor, resisted exercises using a Kinetron, and treadmill walking, intervention occurred during physiotherapy sessions of 60 minutes/day 5 days/week for 8 weeks, progression achieved via velocity and resistance (Kinetron) increments Control: physiotherapy sessions of 60 minutes/day 5 days/week for 8 weeks not including the task-oriented gait training content above Setting: 2 rehabilitation units
Outcomes	Included outcomes: preferred walking speed; Fugl-Meyer leg and arm scores; Timed up-and-go; Barthel Index (ambulation sub-score); Berg Balance Scale Other outcomes: kinematic gait analysis weakened by missing data in 50% participants
Notes	A second control group of conventional therapy was not used for comparison since (1) it was much shorter in duration, and (2) commenced later than the training intervention Outcome data imputed from graphs in publication

Richards 2004 (*Continued*)

Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	Not reported

Salbach 2004

Methods	Design: training versus non-exercise intervention; no follow up Randomisation mechanism: computer; method: stratified on gait speed Allocation concealment: unknown Blinding: investigator blinded: unblinding during assessment of intervention group 18/42 and control group 16/43 Intention-to-treat: yes Losses to follow up: intervention: 3 discontinued (refused to travel, wanted both interventions, groin pain) with 2 of these lost to follow up; control: 4 discontinued (MI, prostate cancer, fall + fracture, wanted other intervention) with 3 of these lost to follow up
Participants	Randomised: 91 participants Intervention: 44 participants; m/f 26/18; age 71 years ± 12 years; 239 ± 83 days post-stroke Control: 47 participants; m/f 30/17; age 73 years ± 8 years; 217 ± 73 days post-stroke Inclusion criteria: first or recurrent stroke; gait deficit from recent stroke; mental competency; independently ambulatory for 10-metres +/- aids or supervision; ability to comprehend instructions; resident in community; discharged from rehabilitation; recent stroke 1 year or less Exclusion criteria: neurological deficit caused by metastatic disease; gait function (6-MWT) equivalent to healthy norms; discharged to permanent care; comorbidity preventing participation in either intervention
Interventions	Intervention: cardiorespiratory training: task-oriented circuit training, performed 55 minutes/day 3 days/week for 6 weeks, comprising a warm up followed by 10 walking-related tasks (step ups, balance beam, kicking ball, stand up and walk, obstacle course, treadmill, walk and carry, speed walk, backward walking, stairs); progression of speed, load and degree of assistance Control: functional practice, whilst seated, of writing, keyboard use, and manipulating cards; some practice encouraged at home Setting: 2 centre location: rehabilitation centre or hospital
Outcomes	Included outcomes: gait endurance 6-MWT; gait comfortable speed; gait maximal speed; timed up-and-go; Berg Balance Scale Other outcomes: activity-specific balance confidence scale
Notes	

Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	Not reported

Teixeira 1999

Methods	Design: training versus no intervention; no follow up First iteration only of a lag control design; participants randomly allocated to immediate or delayed - participants allocated delayed intervention initially received no intervention Randomisation mechanism: unknown; method: unclear ('balanced blocks') Allocation concealment: unknown Blinding: unknown Intention-to-treat: no Losses to follow up: none
Participants	Randomised: 13 participants Intervention: 6 participants; m/f 6/1; age 65.9 years ± 10.2 years; 9.15 ± 12.7 years post-stroke Control: 7 participants; m/f 1/5; age 69.4 years ± 8.85 years; 6.4 ± 6.23 years post-stroke All participants had unilateral stroke resulting in residual weakness or abnormal muscle tone or both Inclusion criteria: at least 9 months post-stroke; independently ambulatory +/- walking aids; no comprehensive aphasia Exclusion criteria: non-stroke related disability
Interventions	Intervention: mixed training: cardiorespiratory and lower extremity strength training 60 to 90 minutes/day 3 days/week for 10 weeks; cardiorespiratory training: graded walking plus stepping or cycling progressing from 10 to 20 minutes/day and from 50% to 70% of maximal cycling work rate over first 5 weeks; strength training: 7 exercises involving use of body weight and progressive resistive exercise using different masses and elastic bands (Thera-Band), each performed as 3 x 10 repetitions and progressing from 50% to 80% of 1 repetition maximum; warm up and warm down 10 to 20 minutes/day Control: no intervention Setting: unclear
Outcomes	Included outcomes: gait preferred speed (22-metre); Adjusted Activity Score; Nottingham Health Profile Other outcomes: insufficient data to compare lower limb muscle strength (peak torque Nm); muscle tone assessment; and stair climbing
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	Not reported

Winstein 2004

Methods	Design: training + usual care versus usual care; follow up 9 months post-stroke, during and after usual care Randomisation mechanism: unknown; method: stratified on Orpington Prognostic Scale (1.6 to 1.4 and 4.2 to 6.8) Allocation concealment: sealed envelopes Blinding: principal investigator but not outcome assessor Intention-to-treat: no Losses to follow up: before end of intervention: 1 (treatment group, medical complications), 1 (control group, lost interest); before end of follow up: 9 (treatment group 4, control group 5 - moved away or lost contact)
Participants	Randomised: 42 participants Intervention: 21 participants; m/f 12/8; time since stroke 17.3 ± 10.6 days Control: 20 participants; m/f 12/8; time since stroke 15.4 ± 5.5 days Age: 29 to 76 years, most 35 to 75 years Inclusion criteria: first stroke; 2 to 35 days post-stroke; FIM score Exclusion criteria: peripheral nerve or orthopaedic condition limiting arm movement; function limited by cardiac disease; SAH without infarction; progressive hydrocephalus; history of brain injury; severe aphasia, neglect, agitation or depression which could limit participation
Interventions	Intervention: strength training: upper limb movements resisted by gravity, free weights, Thera-Band and grip devices for fingers, 60 minutes/day 5 days/week for 4 to 6 weeks, high intensity for 3 days/week and low intensity higher velocity for 2 days/week, training target 20 hours total Control: standard care delivered by occupational therapy, included muscle facilitation exercises using neuro-developmental approach, electrical stimulation, stretching, ADL and caregiver training; activities included use of upper limbs Setting: inpatient rehabilitation hospital and outpatient clinic
Outcomes	Included outcomes: FIM mobility and self care; Fugl-Meyer scores; Functional test of the hemiparetic upper extremity (FTHUE); composite measure of strength (sum of torque from extension and flexion of the wrist elbow and shoulder); grip and pinch force
Notes	Change from baseline scores reported and analysed.

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	Sealed envelopes

Yang 2006

Methods	Design: training versus no intervention; no follow up Randomisation mechanism: picking envelopes Allocation concealment: sealed envelopes Blinding: investigator Intention-to-treat: unknown Losses to follow up: none
Participants	Randomised: 48 participants Intervention: 24 participants; m/f 16/8; age 56.8 years ± 10.2 years; time since stroke > 1 year Control: 24 participants; m/f 18/8; age 60 years ± 10.4 years; time since stroke > 1 year Inclusion criteria: first stroke < 1 year ago; not receiving rehabilitation; ambulatory, independent with no aids; medically stable to participate; able to understand instructions and follow commands Exclusion criteria: medical condition preventing participation; uncontrolled health condition for which exercise was contraindicated
Interventions	Intervention: mixed training performed as a circuit 30 minutes/day 3 days/week for 4 weeks; circuit comprised 6 x 5-minute lower extremity workstations (standing and reaching, sit to stand from chair, stepping forwards and backwards onto blocks, stepping sideways onto blocks, forward step-up onto blocks) , participants encouraged to work hard, progression achieved by increasing number of repetitions in each 5-minute block, and increasing step and chair height, and the complexity of task; extended periods (5-minute) warrant acknowledgement of a cardiorespiratory component despite the author's title (progressive resistance strength training) Control: no intervention
Outcomes	Included outcomes: gait endurance (6-MWT: outcome assessor not blinded); gait speed preferred (10-metres); 3-metre timed up and go; step test; osometric strength of knee and hip ankle extension and flexion; and ankle dorsi-flexion and plantar-flexion (using handheld dynamometer) Other outcomes: gait cadence and stride length
Notes	Data reported as absolute and change scores

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	Sealed envelopes

1-RM: 1 repetition maximum
6-MWT: Six-Minute Walk Test
ACSM: American College of Sports Medicine
ADL: activities of daily living
BMI: body mass index
CT: computerised tomography
DVT: deep vein thrombosis
EADL: extended activities of daily living
ECG: electrocardiogram
f: female
FAC: Functional Ambulation Categories

FES: Funcational Electrical Stimulation
FIM: Functional Independence Measure
HRR: heart rate reserve
IQR: interquartile range
m: male
MI: myocardial infarction
MMSE: Mini Mental State Examination
PNF: post neuromuscular facilitation
psi: pounds per square inch
RER: respiratory exchange ratio
RPE: rating of perceived exertion
SAH: subarachnoid haemorrhage
SD: standard deviation
SE: standard error
SEM: standard error of the mean
SF-36: Short Form 36 questionnaire

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

Study	Reason for exclusion
Ada 2003	Control intervention was described as training and included prescribed walking which confounds this walking study
Akbari 2006	Not valid control group
Barreca 2004	Allocation not randomised; not progressive physical fitness training
Barreca 2007	Not progressive physical fitness training
Baskett 1999	Intervention not physical fitness training: it is described as exercise and activities but no evidence of progressive cardiorespiratory or strength elements, or both
Blennerhassett 2004	Control group perform upper limb training intervention - this could theoretically influence lower limb outcome measures
Bourbonnais 2002	Comparison of upper and lower body exercise
Brown 2002	Comparison of two exercise regimens
Butefisch 1995	Non-random, alternate allocation on admission method
Carr 2003	No relevent comparisons: comparison of cardiorespiratory training and mixed training
Chu 2004	Control group perform upper limb training intervention - this could theoretically influence lower limb outcome measures
Davis 2003	No relevent comparisons: comparison of cardiorespiratory training and strength training

(*Continued*)

Davis 2006	Control group included physical activity: comprised 30 minutes 'sham' aerobic training (which was motorised and passive) and 30 minutes of 'sham' resistance training; resistance training was not passive as it involved movement of legs against gravity and it included some stretching
Dean 1997	Intervention not physical fitness training: although an element of progression is present the intervention is more 'practice' than training as defined in this review
Desrosiers 2005	Not a valid compaison: control contained additional dose of 'usual arm therapy' Intervention not physical fitness training: repetition and practice
Di Lauro 2003	Not a valid comparison It is 'training' versus usual care, the intervention is also not physical fitness training
Dickstein 1986	Intervention not physical fitness training: although post neuromuscular facilitation and Bobath approaches may contain resistive exercises Patient allocation not randomised: based on hospital administration procedures
Dickstein 1997	Intervention not physical fitness training: muscle contractions not resisted and not progressive Patient allocation not randomised: patients were sequentially assigned
Dromerick 2005	Intervention not physical fitness training: constraint induced movement therapy
Drummond 1996	Interventions not physical fitness training: 2 interventions: (1) leisure therapy, and (2) conventional occupational therapy
English 2003	Non-random allocation
Feys 1998	Intervention not physical fitness training: the physical activity (rocking movements) showed no progression of intensity
Fletcher 1994	Not an intervention for stroke; 35% of sample were not stroke
Foley 2004	Only 15 of 338 participants (4%) had stroke
Gelber 1995	Intervention not physical fitness training: comparison of traditional functional retraining and neurodevelopmenal techniques No relevent comparisons
Gilbertson 1998	Intervention not physical fitness training: home-based occupational therapy
Gregson 2006	Intervention was not fitness training, it was repetitive practice with no progression of exercise load except for some participants initially unable to complete the target number of repetitions (10)
Hart 2004	Control intervention not a valid comparison: not usual care, not non-exercise, and balance exercises confound

(*Continued*)

Helbostad 2004	Only 16 of 77 participants with stroke Not a valid comparison, both groups receiving home training
Hidler 2007	No a valid compaison: comparison of 2 types of training
Higgins 2006	Intervention not fitness training: experimental group dexterity practice Control group not valid: included physical activity (walking)
Howe 2005	Intervention not physical fitness training
Hu 2003	Intervention (Bobath) not physical fitness training
Hu 2006	Intervention not physical fitness training
Ishida 2001	Regular rehabilitation was suspended in some participants during a period of usual care Not an exercise intervention
Jongbloed 1989	No relevent control group: comparison of 2 occupational therapy interventions Interventions not physical fitness training
Jongbloed 1991	Intervention not physical fitness training: occupational therapy related to leisure activities
Kamps 2005	Not relevent control group: participants recruited after usual care yet were exposed to physiotherapy and 'ergotherapeutic' interventions
Klassen 2005	Not a valid control group: low intensity upper body exercise
Kwakkel 1999	Intervention not physical fitness training: investigation of rehabilitation of functional tasks The principal author clarified that there was no progression of training intensity, the content of training was variable, and the treadmill training volume comprised only approximately 10% of patients
Laufer 2001	Intervention not physical fitness training: comparison of treadmill ambulation and overground walking No relevent comparisons
LEAPS	No relevent comparisons
Leveille 1998	Contained few people with stroke: intervention (8%) control (9%) Not a valid intervention - other healthy living interventions included Not a valid control - provided access to training facilities of intervention group
Lin 2004	Intervention not physical fitness training
Lincoln 1999	Interventions not physical fitness training: comprised additional physiotherapy
Lincoln 2003	Comparison of 2 physiotherapy approaches

(*Continued*)

Lindsley 1994	This was published as an abstract only, the numerical data were not included and could not be recovered from the authors This intervention may have been training although the abstract contained no mention of progression
Liston 2000	Intervention not physical fitness training
Logan 2003	Intervention not physical fitness training: comprised leisure activities, although sport was included
Logigian 1983	No relevent comparisons: comparison of traditional and facilitation techniques Intervention not physical fitness training: although training elements may have been included it would be difficult to separate the effect of training from therapy
Luft 2004	Intervention not physical fitness training Control group contained physical activity not linked to usual care
Macko 2005	Control group is not non-exercise, or conventional treatment
Maeshima 2003	Not a relevant comparison: 2 exercise groups, with and without family members present
Marigold 2005	Not a relevant comparison: comparison of agility and stretching/weight shifting; neither is physical fitness training
McClellan 2004	Control group not non-exercise
Michaelsen 2006	Control group is not non-exercise
Miller 2000	Intervention not physical fitness training
Moreland 2003	Control group not non-exercise
Nelles 2001	Not a valid comparison Intervention not physical fitness training Included non-stroke healthy controls
Nilsson 2001	Comparison not relevant: comparison of treadmill training with a physiotherapy approach to gait training (motor relearning programme) during usual care
Olney 2006	Not a valid comparison: trial of supervised versus unsupervised exercise
Pan 2004	Not a valid comparison: trial of training versus unsupervised training
Pang 2006b	Control group not non-exercise
Parker 2001	Intervention not physical fitness training: leisure therapy and occupational therapy
Parry 1999	Intervention not physical fitness training: physiotherapy using Bobath and movement science approaches

(*Continued*)

Partridge 2000	Intervention not physical fitness training: comparison of amount of physiotherapy
Peel 1995	Not RCT: case report
Peng 2002	Intervention not physical fitness training
Peurala 2005	Not a valid comparison: control group physical activity
Pitsch 2006	Intervention not physical fitness training
Platz 2001	Intervention not physical fitness training: arm ability training comprised simple functional and manipulative tasks
Platz 2005	2 interventions, neither were physical fitness training
Pomeroy 2001	Intervention not physical fitness training: weighted garments may offer increased resistance to muscle contraction but physical activity was neither controlled nor accurately monitored (patients log book)
Rimmer 2000	Patient allocation not randomised: influenced by geographical location The intervention was physical fitness training and comprised elements of cardiorespiratory, strength and flexibility training
Shatil 2005	Intervention not physical fitness training Control involved some strengthening
Shimada 2003	Only 25% of cohort were people with stroke (only 1 with stroke in control group)
Shimizu 2002	Non-random allocation (order of admission) Only 11 of 16 participants were people with stroke
Sivenius 2007	Comparison not relevent: comparison of 2 therapies
Smith 1981	Intervention not physical fitness training: intensive and conventional physiotherapy and occupational therapy
Sullivan 2002	Comparison not relevant: participants allocated 3 different treadmill training speeds
Sunderland 1994	Intervention not physical fitness training: comparison of orthodox and enhanced physiotherapy
Suputtitada 2004	Control is active walking
Thielman 2004	Not a relevant comparison: resistance training versus task-related training
Thielman 2005	Not a relevant comparison: resistance training versus task-related training
Trueblood 2001	Not randomised

(*Continued*)

Turton 2004	Study not an RCT
van der Lee 1999	Intervention not physical fitness training Comparison not relevant: comparison between forced use of affected arm and use of both arms
Walker 1999	Intervention not physical fitness training: occupational therapy
Werner 1996	Intervention not physical fitness training: physical and occupational therapy
Werner 2002	Not a valid comparison: comparison of 2 forms of training
Widén Holmqvist 1998	Intervention not physical fitness training: home-based physical and occupational therapy
Wing 2006	Control group exposed to exercise (upper body)
Wolfe 2000	Intervention not physical fitness training: community-based physical and occupational therapy
Xiao 2002	Not a valid comparison
Yang 2005	Not a valid comparison: control intervention included strengthening, function, mobility and gait training after competion of usual care
Yokokawa 1999	Ongoing rehabilitation classes were randomised, not individuals; this is biased

RCT: randomised controlled trial

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

AMBULATE

Trial name or title	AMBULATE
Methods	
Participants	122 participants Inclusion criteria: > 18 years old; < 5 years of first stroke; able to walk 10 metres unaided or with a single-point stick; 10 metre walk time > 9 seconds; finished formal rehabilitation; able to gain medical clearance to participate Exclusion criteria: any barriers to taking part in a physical rehabilitation program; insufficient cognition/ language
Interventions	Intervention: Group 1 - treadmill and overground walking program 30 minutes/day 3 days/week for 4 months Group 2 - treadmill and overground walking program 30 minutes/day 3 days/week for 2 months Control - no intervention

AMBULATE (*Continued*)

Outcomes	Primary outcome measures: 10-metre walk speed, 6-minute walk distance Secondary outcome measures: falls, self-efficacy of community ambulation, Adelaide Activites Profile, Euro-QOL Timepoint: measured at baseline, 2 months, 4 months, 6 months and 12 months
Starting date	Start: 27 April 2007 Completion:
Contact information	Associate Professor Louise Ada Discipline of Physiotherapy Faculty of Health Sciences University of Sydney, PO Box 170 Lidcombe NSW 1825, Australia Tel: +61 2 93519544 Fax: +61 2 93519278 Email: L.Ada@usyd.edu.au
Notes	ACTRN12607000227493

Askim

Trial name or title	Does intensive task specific training improve balance after acute stroke?
Methods	
Participants	62 participants Inclusion criteria: admitted to the stroke unit with a diagnosis of stroke; living in the city of Trondheim; included 4 to 14 days after first sign of symptoms; Modified Rankin Scale > 3 before admission to hospital; SSS less than 58 points and more than 14 points; SSS leg item less than 6 points or SSS movement item less than 12 points; discharged to home or a rehabilitation clinic; MMSE score more than 20 points; able and willing to provide informed consent Exclusion criteria: serious heart and lung diseases; other diseases which makes it difficult to evaluate the function; already included in the trial
Interventions	Intervention: intensive task specific balance training (physical therapy technique and exercises) 3 days/week for 4 weeks then 1 day/week for 8 weeks plus usual physical therapy Control: usual physical therapy alone
Outcomes	Primary outcome measures: Berg Balance Scale Secondary outcome measures: MMSE; SSS; Motor Assessment Scale; Timed Up and Go Step Test; walking speed; Barthel Index; Modified Rankin Scale; Fall Efficacy Scale; Stroke Impact Scale Time frame: inclusion 1, 3 and 6 months follow up
Starting date	Start: April 2004 Completion: April 2008
Contact information	Associate Professor Bent Indredavik Department of Neuroscience Faculty of Medicine

Askim (*Continued*)

	Norwegian University of Science and Technology Trondheim Norway
Notes	Norwegian University of Science and Technology

Brissot

Trial name or title	Efficacy of a mechanical gait repetitive training technique in hemiparetic stroke patients
Methods	
Participants	122 participants Inclusion criteria: men or women aged 18 years or more; hemiplegia secondary to stroke; iInterval between stroke and study inclusion of 2 months or less; first time supratentorial stroke; non-ambulatory patient (FAC stage 0); being able to sit unsupported at the edge of the bed; no severe impairment of cognition or communication; written informed consent Exclusion criteria: orthopedic and/or rheumatological disease impairing mobility; other neurological associated disease; history of myocardial infarction or deep veinous embolism or pulmonary embolism less than 3 months before study inclusion; chronic pulmonary disease; intolerance to stand up
Interventions	Intervention: body weight support treadmill gait training + physiotherapy for 4 weeks Control: physiotherapy alone for 4 weeks
Outcomes	Primary outcome measures: walking speed (time needed to walk 10 metres) after the 4 week rehabilitation program Time frame: after 4 weeks Secondary outcome measures: FAC; walking endurance (6 minute walk); time to self sufficient gait recovery; spasticity (modified Ashworth score); Motricity index, need for mobility and self-assistance (Barthel score, PMSI-SSR scores, need for physical assistance); economic evaluation (healthcare requirements, rehabilitation unit length of stay)
Starting date	Start: March 2006 Completion: Unknown
Contact information	Dr Régine Brissot Service de Médecine Physique et Réadaptation Hôpital Pontchaillou Rennes France 35033 Tel: +33 2 9928 4219 Email: regine.brissot@chu-rennes.fr
Notes	NCT00284115

Eng

Trial name or title	The effect of a supplementary exercise program for upper extremity function in stroke rehabilitation
Methods	
Participants	250 stroke patients Inclusion criteria: 19 years of age or older; arm recovery as a rehabilitation goal; have palpatable movement of wrist extension; able to follow 3-step verbal commands Exclusion criteria: unstable cardiovascular status (congestive heart failure, uncontrolled hypertension, uncontrolled atrial fibrillation, or left ventricular failure); significant musculo-skeletal problems (e.g., rheumatoid arthritis) or neurological conditions (e.g. Parkinson's disease) due to conditions other than stroke; receptive aphasia
Interventions	Intervention: usual care + arm and hand exercise (muscle strengthening and stretching, repetitive reaching, folding, stacking, pushing and pulling tasks, picking up objects, and activities that use speed and accuracy) 60 minutes/day for 4 weeks during inpatient care Control: usual care only
Outcomes	Primary outcome measures: the primary outcome is the ability to use the paretic arm in activities of daily living Secondary outcome measures: amount of use and quality of movement of the paretic arm; motor recovery; strength; tone; and health-related quality of life Measures will be evaluated pre and post program
Starting date	Start: July 2006 Completion: June 2008
Contact information	Jocelyn Harris GF Strong Rehab Center Vancouver British Columbia Status: Recruiting Contact: Jocelyn Harris Tel: +1 604 737 6310 Email: jocelyn.harris@vch.ca
Notes	NCT00359255

ExStroke

Trial name or title	ExStroke Pilot Trial: physical exercise after acute ischaemic stroke
Methods	
Participants	314 stroke patients Inclusion criteria: participants aged 40 years or older; patients with a clinical diagnosis of stroke; symptoms lasting 24 hours or more; computed tomography (CT) scan of the brain must either show a new infarct or be normal (patients only with infarcts without clinical symptoms cannot be included); inclusion shall take place before day 90 after stroke onset; informed consent after verbal and written information; the patient must be able to walk either unaided or with a cane or a walker

ExStroke (*Continued*)

	Exclusion criteria: patients who are unable to understand the information, or who cannot cooperate; patients confined to a wheelchair or bed; CT scanning showing intracranial haemorrhage or focal pathology other than infarction, cerebral atrophy, or leucoaraiosis; Modified Rankin score of 4 or 5 before the actual stroke; serious medical disease such as AIDS, metastatic cancer, or abnormalities that the investigator feels may compromise the patient's successful participation in the trial; earlier randomisation in this trial
Interventions	Intervention: instruction in physical training Control: no intervention
Outcomes	Primary outcome measures: difference in physical activity over 24 months Secondary outcome measures: occurrence of stroke, myocardial infarction or death
Starting date	Start: September 2003 Completion: October 2007
Contact information	Dr Gudrun Boysen, MD Dept. of Neurology Bispebjerg Hospital Copenhagen, Denmark, 2400 Email: gb01@bbh.hosp.dk
Notes	NCT00132483

FAME

Trial name or title	A RCT of FAmily Mediated Exercises (FAME) following stroke
Methods	
Participants	40 stroke patients Age > 18 years Inclusion criteria: diagnosis of first unilateral stroke; patients who score between 3.2 and 5.2 on the Orpington Prognostic Scale; patients participating in a physiotherapy programme; patients willing to give informed written consent; patients with family willing to participate in their assigned physiotherapy intervention programme Exclusion criteria: hemiplegia of a non-vascular origin; discharged from hospital less than 2 weeks following stroke; pre-existing neurological disorder; any lower limb orthopaedic condition that may limit exercise capacity; aphasia; cognitive impairment; not willing to give written consent
Interventions	Intervention: routine therapy plus additional 'family mediated exercise therapy' (repetitive sit-to-stand exercises, weight bearing exercises during standing, bridging, straight leg raises, quadriceps strengthening exercises, active/active assisted range of movement exercises for the lower limb and walking; total > 1200 minutes over 8 weeks) Control: routine therapy only
Outcomes	Fugl Meyer Assessment, Berg Balance Scale, Motor Assessment Scale, 6-Minute Walk Test, Barthel Index, re-integration into Normal Living Index; Nottingham Extended Activities of Daily Living Baseline, post-intervention and 3-month follow up

FAME (*Continued*)

Starting date	Start: April 2008 Completion: March 2009
Contact information	Dr Emma Stokes Principal Investigator, University of Dublin, Trinity College Tel: 00 353 1 896 2127 Email: estokes@tcd.ie
Notes	NCT00666744

Kilbreath

Trial name or title	Power training and treadmill training to improve walking ability in sub-acute stroke patients
Methods	
Participants	102 stroke patients aged 45 years to 80 years Inclusion criteria: first stroke resulting in hemiplegia; MMSE score > 15; distance walked in 6-minute walk test is less than the lower limit of 'normal' according to reference equations for healthy adults (adjusted for sex, age, body mass index); score on walking subscale of the Motor Assessment Scale of = 2 Exclusion criteria: unstable cardiac disease; known unrepaired aortic or cerebral aneurysm; haemorrhagic stroke, symptomatic hernias, symptom limiting peripheral vascular disease; end-stage congestive cardiac failure; any of the exclusion criteria contraindicating moderate exercise as outlined by American College of Sports Medicine guidelines for cardiac disease rehabilitation or for frail and elderly adults; significant musculotendinous or bony restrictions of either limb; any serious chronic disease independently causing significant disability or profound atrophy of the affected limb will comprise further exclusion criteria
Interventions	Intervention 1: treadmill training + power training + usual care Intervention 2: treadmill training + usual care Control: usual care Interventions 3 days/week for 10 weeks followed by home-based training for 6 months
Outcomes	Primary outcome measures: distance walked in 6 minutes Secondary outcome measures: other walking variables and balance variables - lower limb muscular strength, power and endurance will be assessed using the pneumatic resistance machines; cardiorespiratory fitness will be assessed from variables collected during a maximal effort cycle test and a multistage exercise test; Stroke impact scale, a self-efficacy scale, health-related qualify of life questionnaire, and a geriatric depression scale
Starting date	Start: March 2004 Completion: December 2006
Contact information	Dr Sharon L Kilbreath School of Physiotherapy, University of Sydney, Sydney, New South Wales, Australia, 2141 Tel: +61 2 9351 9272 Email: s.kilbreath@fhs.usyd.edu.au
Notes	NCT00108030

Kuys

Trial name or title	Treadmill walking to improve walking and fitness following stroke: a single blinded pilot RCT
Methods	
Participants	20 participants Inclusion criteria: diagnosis of stroke; medically stable; able to walk independently prior to stroke; are referred for physiotherapy; have gait deficits on initial assessment; have sufficient cognition and communication to understand the purpose of the study and give informed consent or mini mental state exam > 22; attain a score of at least 3 on Motor Assessment Scale, Walking; able to walk on the treadmill with or without assistance of 1 person Exclusion criteria: have any other neurological conditions that may influence their gait (e.g. multiple sclerosis); have major musculoskeletal disorders that may influence their gait (e.g. amputation, fracture); have any uncompensated sensory dysfunction that may affect their gait (e.g. blindness); have any cardiovascular problems that would limit their participation in physiotherapy
Interventions	Intervention: treadmill walking for 30 minutes/day, 3 days/week for 6 weeks plus usual physiotherapy and rehabilitation Control: usual physiotherapy and rehabilitation incorporating gait retraining based on motor relearning principles without including treadmill walking
Outcomes	Primary outcome measures: Motor Assessment Scale, Walking; spatial temporal gait variables measured by GAITRite Joint angles during overground walking Secondary outcome measures: 6-minute walk test distance; peak oxygen uptake during 6-minute walk test Timepoint: all measures are at baseline, at end of 6-week intervention and 3 months following completion of intervention
Starting date	Start: July 2007
Contact information	Suzanne Kuys Physiotherapy Department Princess Alexandra Hospital Ipswich Road Woolloongabba QLD 4102 Australia Tel: 07 32402401 Email: suzanne˙kuys@health.qld.gov.au
Notes	ACTRN12607000412437

Luft

Trial name or title	Structural neuroplasticity associated with aerobic treadmill training in geriatric chronic stroke survivors
Methods	
Participants	40 patients aged over 60 years with lower extremity paresis after a first-ever clinical stroke longer than 6 months prior to study inclusion will be recruited Inclusion criteria: women and men aged > 60 years; first-ever ischaemic stroke at least prior 6 months; all conventional inpatient and outpatient physical therapy completed; residual hemiparetic gait disturbance

	adequate language and neurocognitive function to participate in exercise training and testing Exclusion criteria: already performing > 20 minutes aerobic exercise 3 times a week; alcohol consumption > 2 oz liquor, or 2 x 4 oz glasses of wine, or 2 x 12 oz cans of beer per day; cardiac history of unstable angina, recent (< 3 months) myocardial infarction, congestive heart failure (NYHA category II), hemodynamically significant valvular dysfunction; medical history of recent hospitalisation (< 3 months) for severe medical disease: symptomatic peripheral arterial occlusive disease, orthopaedic or chronic pain conditions restricting exercise, pulmonary or renal failure, active cancer,poorly controlled hypertension (> 160/100) or diabetes mellitis (fasting glucose >180 mg/dl, HbA1C > 10%); neurological history of dementia, receptive or global aphasia that confounds testing and training (operationally defined as unable to follow 2-point commands), cognitive deficits (other than dementia and aphasia, as above), non-stroke neuromuscular disorder restricting exercise (e.g. Parkinson's Syndrome), untreated major depression; exclusion criteria for magnetic resonance imaging scanning (metal implants (e.g. pacemaker), claustrophobia, etc)
Interventions	Intervention: 3 months progressive graded aerobic treadmill exercise training (3 times/week, duration 10 to 45 minutes) Control: attention control
Outcomes	Aerobic capacity (VO_2peak) Gait velocity
Starting date	Start: January 2008 Completion: July 2009
Contact information	Dr Andreas Luft Department of Neurology, University Hospital Tuebingen
Notes	NCT00614224

Mudge

Trial name or title	The impact of a group exercise programme on usual walking performance in adults who are at least 6 months post stroke: a single blinded RCT
Methods	
Participants	60 participants Inclusion criteria: ≥18 years old; ≥ 6 months post stroke; discharged from rehabilitation; community dwelling; medical clearance to participate in an exercise programme; independently ambulatory (with or without assistive devices) but with some difficulty with walking as confirmed by the physical functioning scale of the Short Form 36 (SF-36) questionnaire Exclusion criteria: progressive neurological disease; significant health problems that adversely affect walking ability; > 2 falls in the previous 6 months; unstable cardiac conditions; uncontrolled hypertension or congestive heart failure; initial gait speed > 1 metre/second
Interventions	Experimental group: circuit training (strengthening and functional exercises) 1 hour/day, 3 days/week for 4 weeks Control group: social and educational attention control 1 hour/day, 3 days/week for 4 weeks

Mudge (*Continued*)

Outcomes	Primary outcome measures: ambulatory physical activity (mean step count over 7 days), assessed 3 weeks and 3 months after the end of intervention Secondary outcome measures: 10-metre walk test; 6-minute walk test; activities-specific balance confidence scale; Rivermead Mobility Index; Physical Activity and Disability Scale Assessed at the end of intervention and at 3 months follow up
Starting date	Start: March 2007 Completion: unknown
Contact information	Suzie Mudge Department of Surgery University of Auckland Private Bag 92019 Auckland 1142 New Zealand Tel: +64 9 3737599 ext. 85387 Email: s.mudge@auckland.ac.nz
Notes	ACTRN12607000081415

Olsson

Trial name or title	Evaluation of an intervention program targeted at improving balance and functional skills after stroke: a randomised controlled study
Methods	
Participants	50 stroke patients Age ≥ 55 years; 3 to 6 months post stroke; ambulatory ≥ 10 metres with or without assistive device; ability to understand simple instructions Exclusion criteria: TIA; independent in walking outdoors; serious visual or hearing impairment; long distance to intervention station
Interventions	Intervention: high intensity functional exercise + theory session Control: theory session
Outcomes	Balance, incidence of falls, self-efficacy, ADL, walking ability
Starting date	Start: September 2006 Completion: February 2008
Contact information	Eva Olsson Tel: +46 90 786 91 37 Email: eva.olsson@physiother.umu.se
Notes	NCT00377689

Patten

Trial name or title	Effects of strength training on upper-limb function in post-stroke hemiparesis
Methods	
Participants	60 participants expected Community dwelling stroke survivors (< 6 months) Aged 18 years or older, male or female
Interventions	Intervention: standard functional rehabilitation + high-intensity upper-body strength training Control: standard functional rehabilitation
Outcomes	Strength, Modified Ashworth Scale, Barthel Index, FIM, Fugl-Meyer (upper body)
Starting date	Start: October 2000 Completion: September 2003
Contact information	Dr Peter Lum VAMC, Palo Alto, California Tel: +1 650 493 5000 664488 E-mail: lum@roses.stanford.edu
Notes	NCT00037908

Pomeroy

Trial name or title	Evaluation of the effects of functional strength training on weakness and function of the lower limb after stroke
Methods	
Participants	300 stroke patients Inclusion criteria: aged over 50 years; between 1 week and 3 months after stroke when recruited to the study; have been independently mobile indoors, with or without aids, before the stroke; have some voluntary movement in the paretic lower limb, i.e. score above 28/100 on the lower limb section of the Motricity Index; demonstrate adequate orientation and communication (be able to complete a one-stage command using the non-paretic upper limb e.g. point at the ceiling)
Interventions	Intervention 1: conventional therapy + additional conventional therapy Intervention 2: conventional therapy + functional strength training Control: conventional therapy alone 1 hour/day, 4 days/week for 6 weeks
Outcomes	Primary outcome measures: maximum torque around the knee joint, gait velocity Secondary outcome measures: Modified Rivermead Mobility Index; lower limb kinematics during standing up, sitting down and walking; timing and pattern of muscle activation during functional activity; EuroQuol for health-related quality of life; transmission in the corticospinal pathways for suitable patients who provide additional written informed consent for TMS

Pomeroy (*Continued*)

Starting date	Start: January 2004 Completion: December 2006
Contact information	Dr Valerie M Pomeroy St George's Hospital NHS Trust, London, United Kingdom, SW17 0RE Tel: +44(0)20 8725 5327 Email: v.pomeroy@sgul.ac.uk
Notes	NCT00322192

Protas

Trial name or title	Stroke rehabilitation outcomes with supported treadmill ambulation training
Methods	
Participants	48 recent unilateral stroke patients expected Aged 18 years or older, male or female
Interventions	Intervention: supported treatmill ambulation training + usual care Control: usual care
Outcomes	FIM, oxygen consumption, BMCA
Starting date	Start: January 2001 Completion: December 2003
Contact information	Dr Elizabth Protas VAMC, Houston, Texas Tel: +1 713 794 7117 E-mail: lim.peter@houston.va.gov
Notes	NCT00037895

Quaney

Trial name or title	Effect of cardiovascular fitness on motor learning and executive function in individuals after stroke
Methods	
Participants	40 stroke patients Age: 18 Years to 85 years Inclusion criteria: single ischaemic stroke occuring 6 to 72 months prior; Fugl-Meyer score (upper + lower extremity) 45 or greater; mini mental status score of > 23; approval of the patient's medical doctor Exclusion criteria: already performing > 20 minutes of cardiovascular exercise 3 times/week or more; alcohol consumption of > 2 oz liquor, 8 oz wine or 24 oz beer/day; cardiac history of unstable angina, recent myocardial infarction within the last 3 months, congestive heart failure, significant valve dysfunction; medical history

Quaney (*Continued*)

	of recent hospitalisation (> 3 months) for medical illness; symptomatic peripheral arterial occlusive disease; orthopedic or chronic pain conditions restricting exercise; pulmonary or renal failure; active cancer; unstable hypertension (> 160/100 mmHg); diabetes mellitus (fasting glucose > 180 NG/dk, HgA1C > 10%) that is unable to be controlled < month; receptive or expressive aphasia as indicated on MMSE; multiple strokes or other neuromuscular conditions; major depression that is untreated using the Beck depression inventory
Interventions	Intervention: aerobic training 3 times/week for 8 weeks Control: usual daily activities
Outcomes	Primary outcome: motor learning behavioral measures; executive function behavioral measures Baseline, 8 weeks, 12 weeks Secondary outcome: VO_2peak and other aerobic capacity measures; physical disability measures Baseline, 8 weeks, 12 weeks
Starting date	Start: September 2005 Completion: December 2009
Contact information	Dr Barbara Quaney Principal Investigator, University of Kansas Medical Center Kansas City Kansas 66160
Notes	NCT00228306

REHAB

Trial name or title	Reshaping Exercise Habits And Beliefs (REHAB): pilot testing of a behavioural intervention to improve mobility after stroke
Methods	
Participants	90 stroke patients aged 40 to 85 years Inclusion criteria: 40 to 85 years old ischaemic stroke patients; stroke onset < 90 days at enrollment; hemiparetic gait disorder; patients able to walk 30 feet with or without assistive device; sufficient English comprehension to understand instructions, provide consent, and answer questions; live within 30 miles of the Greater Baltimore area Exclusion criteria: dementia (extended MMSE < 85 or < 80 if education level below 9th grade); untreated major clinical depression (CES-D > 16); heavy alcohol use (< 3 oz liquor, 3 x 4-oz glasses of wine, or 3 x 12-oz beers daily); active cancer, or any illness with a life expectancy of less than 6 months; any condition in which exercise activity would be contraindicated including, but not limited to: unstable angina, cardiac ischaemic event within the past 6 months, congestive heart failure (Stage III or IV), major orthopedic chronic pain or non-stroke neuromuscular disorders restricting exercise, oxygen-dependent COPD or peripheral neuropathy
Interventions	Intervention: home-based exercise prescriptions with weekly motivational telephone calls Control: stroke education program with matched attention phone calls
Outcomes	Ambulatory Activity Profile

REHAB (*Continued*)

Starting date	Start: October 2006 Completion: June 2010
Contact information	Alyssa D Stookey, PhD MS VA Maryland Health Care System, Baltimore, Maryland, United States, 21201 Tel: +1 410 605 7000 ext 5431 Email: alyssa.mealey@va.gov
Notes	NCT00431821

SIRROWS

Trial name or title	SIRROWS (Stroke Inpatient Rehabilitation Reinforcement of Walking Speed)
Methods	
Participants	500 participants Inclusion criteria: 35 years or older; suffered a stroke from any cause that is unlikely to progress or recur within 2 years of onset; unilateral hemiparesis with strength of the proximal leg muscles = 4/5; able to follow simple instructions and understand verbal reinforcement about walking speed; able to take 5 steps with not more than the assistance of one person Exclusion criteria: premorbid walking difficulty in the community; history of dementia; current medical disease that will limit physical therapy at the time of randomisation
Interventions	Intervention: daily reinforcement of walking speed during a daily 10-metre walk as part of their usual physical therapy Control: no reinforcement of walking speed: inpatients complete a 10-metre walk as part of their daily physical therapy but are not given any encouragement to walk faster or feedback on their walking speed
Outcomes	Primary outcome measures: gait speed Secondary outcome measures: distance walked in 3 minutes; FAC; number of falls post inpatient rehabilitation
Starting date	Start: May 2007 Completion: April 2009
Contact information	Dr Bruce H Dobkin University of California Los Angeles Los Angeles California 90095 USA Tel: +1 310 206 6500 Email: bdobkin@mednet.ucla.edu
Notes	NCT00428480

Suskin 2007

Trial name or title	Cardiac Rehabilitation for TIA patients (CR-TIA)
Methods	
Participants	200 participants Inclusion criteria: age > 20 years; documented TIA or mild non-disabling stroke within the previous 3 months; at least 1 of the following vascular risk factors: hypertension, ischaemic heart disease, diabetes mellitus, dyslipidaemia or cigarette smoking Exclusion criteria: inability to speak or understand English or provide informed consent; severe aphasia that renders communication difficult or impossible; Modified Rankin Scale score of greater than or equal to 3; MMSE score $\leq$ 20; evidence of intracranial haemorrhage confirmed by CT scan or MRI study; anticipated or recent (< 30 days) carotid endarterectomy, angioplasty and/or stenting; resides > 1 hour travel time from London or Ottawa; prior participation in a CCR program; inability to perform expected exercise training of CCR program; evidence of cardioembolic source for TIA/stroke such as atrial fibrillation, valvular disease, septal defect or left ventricular wall motion abnormality; participation in another clinical trial that could interfere with the intervention or outcomes of the current study
Interventions	Intervention: comprehensive CCR Program plus usual care (include home-based exercise 2 days/week for 6 months) Control: usual care alone
Outcomes	Primary outcome measures: functional capacity; lipid profile; depression symptoms; cognition Secondary outcome measures: cerebrovascular and cardiovascular events; physiological, anthropometric and behavioral vascular risk factors; neurocognitive measure; quality of life Time frame: 6 months
Starting date	Start: September 2007 Completion: March 2010
Contact information	Neville G. Suskin, MBChB, MSc University of Western Ontario and London Health Sciences Centre London Ontario Canada N6A 5A5 Tel: + 1 519 663 3488 Email: neville.suskin@lhsc.on.ca
Notes	NCT00536562

Tanne

Trial name or title	Early aerobic training program after ischaemic stroke
Methods	
Participants	Number of participants is unknown Age: 18 to 80 years; sex: both Inclusion criteria: minor ischaemic stroke

Tanne (*Continued*)

	Exclusion criteria: unstable angina; severe lung disease; severe symptomatic peripheral vascular disease; dementia or other severe neurological disease; other severe uncontrolled medical problem
Interventions	Intervention: immediate aerobic training program Control: 6 weeks of low intensity stretching and coordination exercises followed by a supervised aerobic training program
Outcomes	Primary outcome measure: 6-Minute Walk Test at 6 weeks; Modified Bruce Exercise Test at 6 weeks; activity by ankle accelerometer at 6 weeks Secondary outcome measures: recurrent vascular events at 6 weeks; metabolic syndrome at 6 weeks; stair climbing ascend and descend test at 6 weeks; 4-Square Step Test at 6 weeks; gait symmetry by SmartStep at 6 weeks; Walking Impairment Questionnaire at 6 weeks; Rivermead Mobility Index at 6 weeks; similar outcome measures 3 months later
Starting date	Start: October 2005 Completion: unknown
Contact information	Dr David Tanne, MD, Principal Investigator, Sheba Medical Center, Israel Tel: Hashomer 52621
Notes	NCT00248222

ADL: activities of daily living
BMCA: brain motor control assessment
CCR: Circulatory, Cardiac and Respiratory Research Program
CES-D: Center for Epidemiologic Studies Depression Scale
COPD: chronic obstructive pulmonary disease
CT: computerised tomography
FAC: Functional Ambulation Classification
FIM: Functional Independence Measure
MMSE: Mini Mental State Examination
MRI: magnetic resonance imaging
NYHA: New York Heart Association
SSS: Scandinavian Stroke Scale
TIA: transient ischaemic attack
TMS: transcranial magnetic stimulation

DATA AND ANALYSES

Comparison 1. Cardiorespiratory training versus control - end of intervention

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Disability - FIM Instrument	3	162	Std. Mean Difference (IV, Fixed, 95% CI)	0.21 [-0.10, 0.52]
1.1 During usual care	1	52	Std. Mean Difference (IV, Fixed, 95% CI)	0.23 [-0.32, 0.78]
1.2 After usual care	2	110	Std. Mean Difference (IV, Fixed, 95% CI)	0.20 [-0.17, 0.58]
2 Disability - Rivermead Mobility Index	2		Mean Difference (IV, Random, 95% CI)	Subtotals only
2.1 During usual care	2	232	Mean Difference (IV, Random, 95% CI)	1.25 [-0.74, 3.25]
2.2 During usual care - LOCF	2	238	Mean Difference (IV, Random, 95% CI)	1.18 [-0.92, 3.29]
2.3 After usual care	0	0	Mean Difference (IV, Random, 95% CI)	Not estimable
3 Disability - mixed FIM + Barthel scales	4	317	Std. Mean Difference (IV, Fixed, 95% CI)	0.42 [0.19, 0.64]
3.1 During usual care	2	207	Std. Mean Difference (IV, Fixed, 95% CI)	0.53 [0.25, 0.81]
3.2 After usual care	2	110	Std. Mean Difference (IV, Fixed, 95% CI)	0.20 [-0.17, 0.58]
4 Adverse events and risk factors - blood pressure, systolic	3	144	Mean Difference (IV, Random, 95% CI)	0.83 [-12.50, 14.17]
4.1 During usual care	1	12	Mean Difference (IV, Random, 95% CI)	26.33 [1.95, 50.71]
4.2 After usual care	2	132	Mean Difference (IV, Random, 95% CI)	-5.46 [-11.76, 0.85]
5 Adverse events and risk factors - blood pressure, diastolic	3	144	Mean Difference (IV, Fixed, 95% CI)	-0.23 [-3.33, 2.87]
5.1 During usual care	1	12	Mean Difference (IV, Fixed, 95% CI)	1.0 [-10.46, 12.46]
5.2 After usual care	2	132	Mean Difference (IV, Fixed, 95% CI)	-0.33 [-3.55, 2.89]
6 Physical fitness - cardiorespiratory, VO2 (ml/kg/min)	2	54	Mean Difference (IV, Random, 95% CI)	3.52 [1.52, 5.52]
6.1 During usual care	1	12	Mean Difference (IV, Random, 95% CI)	3.43 [0.56, 6.30]
6.2 After usual care	1	42	Mean Difference (IV, Random, 95% CI)	3.60 [0.82, 6.38]
7 Physical fitness - cardiorespiratory, maximum cycling work rate (Watts)	4	221	Std. Mean Difference (IV, Random, 95% CI)	0.60 [0.18, 1.02]
7.1 During usual care	2	89	Std. Mean Difference (IV, Random, 95% CI)	0.32 [-0.34, 0.98]
7.2 After usual care	2	132	Std. Mean Difference (IV, Random, 95% CI)	0.83 [0.47, 1.18]
8 Mobility - functional ambulation categories	4		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
8.1 During usual care	4	228	Mean Difference (IV, Fixed, 95% CI)	0.72 [0.46, 0.98]
8.2 After usual care	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
9 Mobility - gait speed, maximal (m/min over 5 to 10 metres)	8	462	Mean Difference (IV, Fixed, 95% CI)	6.47 [2.37, 10.57]
9.1 During usual care	7	371	Mean Difference (IV, Fixed, 95% CI)	5.93 [1.61, 10.24]
9.2 After usual care	1	91	Mean Difference (IV, Fixed, 95% CI)	11.40 [-1.61, 24.41]
10 Mobility - gait speed, maximal (m/min over 5 to 10 metres); subgroup: ACSM	8	462	Mean Difference (IV, Fixed, 95% CI)	6.47 [2.37, 10.57]
10.1 ACSM criteria met	2	123	Mean Difference (IV, Fixed, 95% CI)	2.55 [-3.03, 8.13]
10.2 ACSM criteria unknown	4	235	Mean Difference (IV, Fixed, 95% CI)	9.44 [2.02, 16.86]

10.3 ACSM criteria not met	2	104	Mean Difference (IV, Fixed, 95% CI)	14.22 [3.83, 24.61]
11 Mobility - gait speed, preferred (m/min)	4	356	Mean Difference (IV, Fixed, 95% CI)	5.15 [2.05, 8.25]
11.1 During usual care	2	175	Mean Difference (IV, Fixed, 95% CI)	6.55 [1.32, 11.77]
11.2 After usual care	2	181	Mean Difference (IV, Fixed, 95% CI)	4.39 [0.53, 8.24]
12 Mobility - gait endurance (6-MWT metres)	3	296	Mean Difference (IV, Fixed, 95% CI)	38.93 [14.34, 63.52]
12.1 During usual care	2	205	Mean Difference (IV, Fixed, 95% CI)	38.66 [11.19, 66.13]
12.2 After usual care	1	91	Mean Difference (IV, Fixed, 95% CI)	40.0 [-15.13, 95.13]
13 Mobility - gait endurance (m/min)	4	309	Mean Difference (IV, Fixed, 95% CI)	7.44 [3.47, 11.42]
13.1 During usual care	3	218	Mean Difference (IV, Fixed, 95% CI)	7.63 [3.23, 12.03]
13.2 After usual care	1	91	Mean Difference (IV, Fixed, 95% CI)	6.60 [-2.66, 15.86]
14 Physical function - Berg Balance scale	2	168	Mean Difference (IV, Fixed, 95% CI)	1.44 [-2.15, 5.03]
14.1 During usual care	1	77	Mean Difference (IV, Fixed, 95% CI)	-0.30 [-5.52, 4.92]
14.2 After usual care	1	91	Mean Difference (IV, Fixed, 95% CI)	3.0 [-1.94, 7.94]

Comparison 2. Cardiorespiratory training versus control - end of retention follow up

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Disability - Rivermead Mobility Index	2		Mean Difference (IV, Random, 95% CI)	Subtotals only
1.1 During usual care	2	221	Mean Difference (IV, Random, 95% CI)	1.01 [-1.39, 3.41]
1.2 During usual care - LOCF Bateman	2	239	Mean Difference (IV, Random, 95% CI)	1.14 [-0.98, 3.26]
1.3 After usual care	0	0	Mean Difference (IV, Random, 95% CI)	Not estimable
2 Mobility - gait speed, maximal (m/min)	3	283	Mean Difference (IV, Fixed, 95% CI)	9.01 [4.42, 13.61]
2.1 During usual care	3	283	Mean Difference (IV, Fixed, 95% CI)	9.01 [4.42, 13.61]
2.2 After usual care	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
3 Mobility - gait speed, maximal (m/min); subgroup: specificity	3	268	Mean Difference (IV, Fixed, 95% CI)	7.53 [2.59, 12.48]
3.1 Gait specific training	2	204	Mean Difference (IV, Fixed, 95% CI)	10.60 [4.91, 16.29]
3.2 Cycle ergometry training	1	64	Mean Difference (IV, Fixed, 95% CI)	-1.90 [-11.89, 8.09]
4 Mobility - gait endurance (6-MWT metres)	2	204	Mean Difference (IV, Fixed, 95% CI)	57.51 [25.82, 89.19]
4.1 During usual care	2	204	Mean Difference (IV, Fixed, 95% CI)	57.51 [25.82, 89.19]
4.2 After usual care	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable

Comparison 3. Strength training versus control - end of intervention

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Physical fitness - muscle strength	2	60	Std. Mean Difference (IV, Fixed, 95% CI)	0.58 [0.06, 1.10]
1.1 During usual care	0	0	Std. Mean Difference (IV, Fixed, 95% CI)	Not estimable
1.2 During and after usual care	1	40	Std. Mean Difference (IV, Fixed, 95% CI)	0.47 [-0.16, 1.10]
1.3 After usual care	1	20	Std. Mean Difference (IV, Fixed, 95% CI)	0.84 [-0.09, 1.76]
2 Mobility - gait speed, maximal (m/min)	2	62	Mean Difference (IV, Fixed, 95% CI)	-1.17 [-5.53, 3.19]
2.1 During usual care	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
2.2 After usual care	2	62	Mean Difference (IV, Fixed, 95% CI)	-1.17 [-5.53, 3.19]
3 Mobility - gait speed, preferred (m/min)	3		Mean Difference (IV, Random, 95% CI)	Subtotals only
3.1 During usual care	0	0	Mean Difference (IV, Random, 95% CI)	Not estimable
3.2 After usual care	2	62	Mean Difference (IV, Random, 95% CI)	-2.61 [-7.73, 2.51]
3.3 After usual care - sensitivity analysis	3	110	Mean Difference (IV, Random, 95% CI)	2.37 [-6.80, 11.53]
4 Mobility - gait endurance (6-MWT metres)	2	90	Mean Difference (IV, Fixed, 95% CI)	39.33 [-8.20, 86.85]
4.1 During usual care	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
4.2 After usual care	2	90	Mean Difference (IV, Fixed, 95% CI)	39.33 [-8.20, 86.85]
5 Physical function - stair climbing, maximal (sec/step)	2	61	Std. Mean Difference (IV, Fixed, 95% CI)	0.04 [-0.47, 0.55]
5.1 During usual care	0	0	Std. Mean Difference (IV, Fixed, 95% CI)	Not estimable
5.2 After usual care	2	61	Std. Mean Difference (IV, Fixed, 95% CI)	0.04 [-0.47, 0.55]

Comparison 5. Mixed training versus control - end of intervention

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Disability - Lawton IADL	2		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
1.1 During usual care	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
1.2 After usual care	2	113	Mean Difference (IV, Fixed, 95% CI)	0.83 [-0.51, 2.17]
2 Disability - Barthel ADL	2		Mean Difference (IV, Random, 95% CI)	Subtotals only
2.1 During usual care	0	0	Mean Difference (IV, Random, 95% CI)	Not estimable
2.2 After usual care	2	113	Mean Difference (IV, Random, 95% CI)	2.87 [-1.37, 7.12]
3 Disability - Barthel ADL ambulation subscale	2		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
3.1 During usual care	2	79	Mean Difference (IV, Fixed, 95% CI)	-1.94 [-5.92, 2.04]
3.2 After usual care	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
4 Disability - Barthel & FIM Instrument	3	179	Std. Mean Difference (IV, Fixed, 95% CI)	0.27 [-0.02, 0.57]
4.1 During usual care	0	0	Std. Mean Difference (IV, Fixed, 95% CI)	Not estimable
4.2 After usual care	3	179	Std. Mean Difference (IV, Fixed, 95% CI)	0.27 [-0.02, 0.57]

5 Physical fitness - strength, ankle dorsiflexion*	2		Std. Mean Difference (IV, Random, 95% CI)	Subtotals only
5.1 During usual care	0	0	Std. Mean Difference (IV, Random, 95% CI)	Not estimable
5.2 After usual care	2	148	Std. Mean Difference (IV, Random, 95% CI)	0.80 [-0.82, 2.41]
6 Physical fitness - strength, knee extension*	2		Std. Mean Difference (IV, Fixed, 95% CI)	Subtotals only
6.1 During usual care	0	0	Std. Mean Difference (IV, Fixed, 95% CI)	Not estimable
6.2 After usual care	2	148	Std. Mean Difference (IV, Fixed, 95% CI)	0.34 [0.02, 0.67]
7 Mobility - gait preferred speed (m/min)	8	332	Std. Mean Difference (IV, Fixed, 95% CI)	0.27 [0.05, 0.49]
7.1 During usual care	2	79	Std. Mean Difference (IV, Fixed, 95% CI)	-0.01 [-0.45, 0.43]
7.2 After usual care	6	253	Std. Mean Difference (IV, Fixed, 95% CI)	0.36 [0.11, 0.61]
8 Mobility - gait preferred speed (m/min); subgroup: therapy time	8	332	Std. Mean Difference (IV, Fixed, 95% CI)	0.27 [0.05, 0.49]
8.1 Confounded	5	196	Std. Mean Difference (IV, Fixed, 95% CI)	0.51 [0.23, 0.80]
8.2 Unconfounded	3	136	Std. Mean Difference (IV, Fixed, 95% CI)	-0.07 [-0.41, 0.27]
9 Mobility - gait endurance (6 MWT metres)	4	177	Std. Mean Difference (IV, Fixed, 95% CI)	0.39 [0.09, 0.69]
9.1 During usual care	0	0	Std. Mean Difference (IV, Fixed, 95% CI)	Not estimable
9.2 After usual care	4	177	Std. Mean Difference (IV, Fixed, 95% CI)	0.39 [0.09, 0.69]
10 Physical function - Fugl-Meyer lower extremity	4	199	Std. Mean Difference (IV, Fixed, 95% CI)	0.25 [-0.03, 0.53]
10.1 During usual care	2	79	Std. Mean Difference (IV, Fixed, 95% CI)	0.08 [-0.36, 0.53]
10.2 After usual care	2	120	Std. Mean Difference (IV, Fixed, 95% CI)	Not estimable
11 Physical function - Fugl-Meyer upper extremity	4	199	Std. Mean Difference (IV, Fixed, 95% CI)	0.07 [-0.21, 0.35]
11.1 During usual care	2	79	Std. Mean Difference (IV, Fixed, 95% CI)	-0.04 [-0.48, 0.40]
11.2 After usual care	2	120	Std. Mean Difference (IV, Fixed, 95% CI)	0.14 [-0.22, 0.50]
12 Physical function - Berg Balance	4	199	Std. Mean Difference (IV, Random, 95% CI)	0.21 [-0.27, 0.69]
12.1 During usual care	2	79	Std. Mean Difference (IV, Random, 95% CI)	-0.15 [-0.60, 0.29]
12.2 After usual care	2	120	Std. Mean Difference (IV, Random, 95% CI)	0.54 [0.17, 0.90]
13 Physical function - functional reach	2		Std. Mean Difference (IV, Fixed, 95% CI)	Subtotals only
13.1 During usual care	0	0	Std. Mean Difference (IV, Fixed, 95% CI)	Not estimable
13.2 After usual care	2	166	Std. Mean Difference (IV, Fixed, 95% CI)	0.13 [-0.18, 0.43]
14 Physical function - timed up and go (sec)	4	185	Mean Difference (IV, Fixed, 95% CI)	-1.14 [-2.06, -0.22]
14.1 During usual care	1	62	Mean Difference (IV, Fixed, 95% CI)	-2.0 [-11.24, 7.24]
14.2 After usual care	3	123	Mean Difference (IV, Fixed, 95% CI)	-1.13 [-2.05, -0.21]
15 Physical function - timed up and go (sec); sensitivity analysis: excluding Yang 2006	3	137	Mean Difference (IV, Fixed, 95% CI)	-1.16 [-2.93, 0.62]
15.1 During usual care	1	62	Mean Difference (IV, Fixed, 95% CI)	-2.0 [-11.24, 7.24]
15.2 After usual care	2	75	Mean Difference (IV, Fixed, 95% CI)	-1.12 [-2.93, 0.69]
16 Health related QoL - SF-36 role physical	3	178	Std. Mean Difference (IV, Fixed, 95% CI)	0.56 [0.26, 0.86]
16.1 During usual care	0	0	Std. Mean Difference (IV, Fixed, 95% CI)	Not estimable
16.2 After usual care	3	178	Std. Mean Difference (IV, Fixed, 95% CI)	0.56 [0.26, 0.86]
17 Health related QoL - SF-36 physical function	2	112	Std. Mean Difference (IV, Fixed, 95% CI)	0.48 [0.10, 0.85]

17.1 During usual care	0	0	Std. Mean Difference (IV, Fixed, 95% CI)	Not estimable
17.2 After usual care	2	112	Std. Mean Difference (IV, Fixed, 95% CI)	0.48 [0.10, 0.85]
18 Health related QoL - SF-36 social function	2	112	Std. Mean Difference (IV, Random, 95% CI)	0.48 [-0.22, 1.17]
18.1 During usual care	0	0	Std. Mean Difference (IV, Random, 95% CI)	Not estimable
18.2 After usual care	2	112	Std. Mean Difference (IV, Random, 95% CI)	0.48 [-0.22, 1.17]
19 Mobility - Community Ambulation Speed (> 0.8 m/sec)	2	165	Odds Ratio (M-H, Fixed, 95% CI)	1.31 [0.70, 2.44]
19.1 During usual care	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
19.2 After usual care	2	165	Odds Ratio (M-H, Fixed, 95% CI)	1.31 [0.70, 2.44]

Comparison 6. Mixed training versus control - end of retention follow up

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Disability - Barthel & FIM combined	2		Std. Mean Difference (IV, Fixed, 95% CI)	Subtotals only
1.1 During usual care	0	0	Std. Mean Difference (IV, Fixed, 95% CI)	Not estimable
1.2 After usual care	2	146	Std. Mean Difference (IV, Fixed, 95% CI)	-0.09 [-0.41, 0.24]
2 Mobility - gait preferred speed (m/min)	3	135	Mean Difference (IV, Fixed, 95% CI)	-2.34 [-5.17, 0.49]
2.1 During usual care	1	62	Mean Difference (IV, Fixed, 95% CI)	-3.60 [-14.80, 7.60]
2.2 After usual care	2	73	Mean Difference (IV, Fixed, 95% CI)	-2.26 [-5.18, 0.67]
3 Physical function - timed up and go (sec)	3	136	Mean Difference (IV, Fixed, 95% CI)	-0.30 [-1.14, 0.55]
3.1 During usual care	1	62	Mean Difference (IV, Fixed, 95% CI)	Not estimable
3.2 After usual care	2	74	Mean Difference (IV, Fixed, 95% CI)	-0.30 [-1.15, 0.55]
4 Health related QoL - SF-36 role physical	2	146	Mean Difference (IV, Fixed, 95% CI)	11.61 [2.38, 20.84]
4.1 During usual care	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable
4.2 After usual care	2	146	Mean Difference (IV, Fixed, 95% CI)	11.61 [2.38, 20.84]
5 Health related QoL - SF-36 physical function	2	146	Mean Difference (IV, Random, 95% CI)	2.46 [-7.20, 12.11]
5.1 During usual care	0	0	Mean Difference (IV, Random, 95% CI)	Not estimable
5.2 After usual care	2	146	Mean Difference (IV, Random, 95% CI)	2.46 [-7.20, 12.11]
6 Case fatality	3	211	Odds Ratio (M-H, Fixed, 95% CI)	0.48 [0.04, 5.47]
6.1 During usual care	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
6.2 After usual care	3	211	Odds Ratio (M-H, Fixed, 95% CI)	0.48 [0.04, 5.47]
7 Mobility - Community Ambulation Speed (> 0.8 m/sec)	2	165	Odds Ratio (M-H, Fixed, 95% CI)	1.19 [0.63, 2.26]
7.1 During usual care	0	0	Odds Ratio (M-H, Fixed, 95% CI)	Not estimable
7.2 After usual care	2	165	Odds Ratio (M-H, Fixed, 95% CI)	1.19 [0.63, 2.26]

Comparison 7. Cardiorespiratory training versus strength training

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Mobility - gait preferred speed (m/min)	12		Std. Mean Difference (IV, Fixed, 95% CI)	Subtotals only
1.1 Cardiorespiratory training	4	356	Std. Mean Difference (IV, Fixed, 95% CI)	0.34 [0.13, 0.55]
1.2 Mixed training	8	332	Std. Mean Difference (IV, Fixed, 95% CI)	0.27 [0.05, 0.49]
2 Mobility - gait preferred speed (m/min); sensitivity analysis: confounded studies removed	6		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
2.1 Cardiorespiratory training	3	266	Mean Difference (IV, Fixed, 95% CI)	6.98 [2.39, 11.56]
2.2 Mixed training	3	136	Mean Difference (IV, Fixed, 95% CI)	-0.25 [-3.21, 2.71]

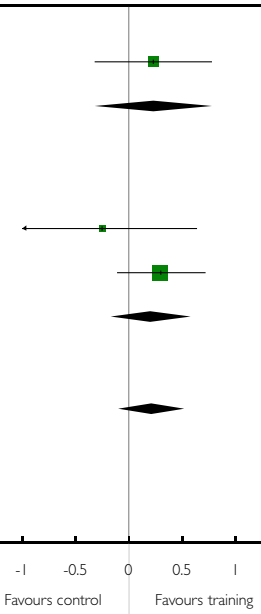
Analysis 1.1. Comparison 1 Cardiorespiratory training versus control - end of intervention, Outcome 1 Disability - FIM Instrument.

Review: Physical fitness training for stroke patients

Comparison: 1 Cardiorespiratory training versus control - end of intervention

Outcome: 1 Disability - FIM Instrument

Study or subgroup	Training N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Fixed,95% CI	Weight	Std. Mean Difference IV,Fixed,95% CI
1 During usual care							
Bateman 2001	23	104.74 (17.7)	29	100.38 (18.92)		31.9 %	0.23 [-0.32, 0.78]
Subtotal (95% CI)	**23**		**29**			**31.9 %**	**0.23 [-0.32, 0.78]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.83 (P = 0.40)							
2 After usual care							
Cuviello-Palmer 1988	10	44.79 (8.77)	10	47.18 (9.88)		12.4 %	-0.25 [-1.13, 0.64]
Katz-Leurer 2003	46	105.8 (12.5)	44	101.4 (16)		55.7 %	0.30 [-0.11, 0.72]
Subtotal (95% CI)	**56**		**54**			**68.1 %**	**0.20 [-0.17, 0.58]**
Heterogeneity: Chi^2 = 1.22, df = 1 (P = 0.27); I^2 =18%							
Test for overall effect: Z = 1.07 (P = 0.29)							
Total (95% CI)	**79**		**83**			**100.0 %**	**0.21 [-0.10, 0.52]**
Heterogeneity: Chi^2 = 1.23, df = 2 (P = 0.54); I^2 =0.0%							
Test for overall effect: Z = 1.35 (P = 0.18)							
Test for subgroup differences: Chi^2 = 0.01, df = 1 (P = 0.93), I^2 =0.0%							



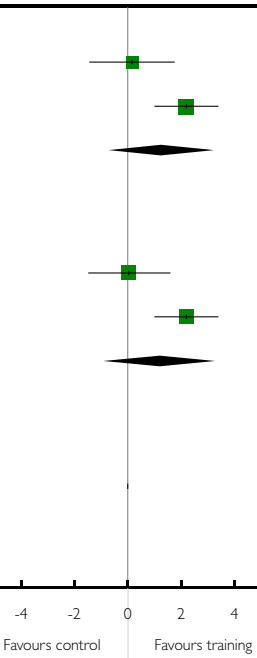
Analysis 1.2. Comparison 1 Cardiorespiratory training versus control - end of intervention, Outcome 2 Disability - Rivermead Mobility Index.

Review: Physical fitness training for stroke patients

Comparison: 1 Cardiorespiratory training versus control - end of intervention

Outcome: 2 Disability - Rivermead Mobility Index

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 During usual care							
Bateman 2001	36	10.06 (3.53)	41	9.9 (3.65)		44.8 %	0.16 [-1.45, 1.77]
Pohl 2007	77	8.5 (3.9)	78	6.3 (3.7)		55.2 %	2.20 [1.00, 3.40]
Subtotal (95% CI)	**113**		**119**			**100.0 %**	**1.25 [-0.74, 3.25]**
Heterogeneity: $Tau^2 = 1.56$; $Chi^2 = 3.99$, df = 1 (P = 0.05); $I^2 = 75\%$							
Test for overall effect: Z = 1.23 (P = 0.22)							
2 During usual care - LOCF							
Bateman 2001	39	9.87 (3.58)	44	9.82 (3.59)		45.6 %	0.05 [-1.50, 1.60]
Pohl 2007	77	8.5 (3.9)	78	6.3 (3.7)		54.4 %	2.20 [1.00, 3.40]
Subtotal (95% CI)	**116**		**122**			**100.0 %**	**1.18 [-0.92, 3.29]**
Heterogeneity: $Tau^2 = 1.81$; $Chi^2 = 4.65$, df = 1 (P = 0.03); $I^2 = 78\%$							
Test for overall effect: Z = 1.10 (P = 0.27)							
3 After usual care							
Subtotal (95% CI)	**0**		**0**			**0.0 %**	**0.0 [0.0, 0.0]**
Heterogeneity: not applicable							
Test for overall effect: not applicable							



Analysis 1.3. Comparison 1 Cardiorespiratory training versus control - end of intervention, Outcome 3 Disability - mixed FIM + Barthel scales.

Review: Physical fitness training for stroke patients

Comparison: 1 Cardiorespiratory training versus control - end of intervention

Outcome: 3 Disability - mixed FIM + Barthel scales

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Fixed,95% CI	Weight	Std. Mean Difference IV,Fixed,95% CI
1 During usual care							
Bateman 2001	23	104.74 (17.7)	29	100.38 (18.92)		16.6 %	0.23 [-0.32, 0.78]
Pohl 2007	77	72.3 (21)	78	58.7 (21.6)		48.0 %	0.64 [0.31, 0.96]
Subtotal (95% CI)	**100**		**107**			**64.6 %**	**0.53 [0.25, 0.81]**
Heterogeneity: Chi^2 = 1.53, df = 1 (P = 0.22); I^2 =35%							
Test for overall effect: Z = 3.75 (P = 0.00018)							
2 After usual care							
Cuviello-Palmer 1988	10	44.79 (8.77)	10	47.18 (9.88)		6.5 %	-0.25 [-1.13, 0.64]
Katz-Leurer 2003	46	105.8 (12.5)	44	101.4 (16)		29.0 %	0.30 [-0.11, 0.72]
Subtotal (95% CI)	**56**		**54**			**35.4 %**	**0.20 [-0.17, 0.58]**
Heterogeneity: Chi^2 = 1.22, df = 1 (P = 0.27); I^2 =18%							
Test for overall effect: Z = 1.07 (P = 0.29)							
Total (95% CI)	**156**		**161**			**100.0 %**	**0.42 [0.19, 0.64]**
Heterogeneity: Chi^2 = 4.64, df = 3 (P = 0.20); I^2 =35%							
Test for overall effect: Z = 3.65 (P = 0.00027)							
Test for subgroup differences: Chi^2 = 1.88, df = 1 (P = 0.17), I^2 =47%							

Analysis 1.4. Comparison 1 Cardiorespiratory training versus control - end of intervention, Outcome 4 Adverse events and risk factors - blood pressure, systolic.

Review: Physical fitness training for stroke patients

Comparison: 1 Cardiorespiratory training versus control - end of intervention

Outcome: 4 Adverse events and risk factors - blood pressure, systolic

Study or subgroup	Training N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 During usual care							
da Cunha 2002	6	191.33 (9.93)	6	165 (28.81)		19.0 %	26.33 [1.95, 50.71]
Subtotal (95% CI)	**6**		**6**			**19.0 %**	**26.33 [1.95, 50.71]**
Heterogeneity: not applicable							
Test for overall effect: Z = 2.12 (P = 0.034)							
2 After usual care							
Katz-Leurer 2003	46	130.3 (15.7)	44	136.2 (19.5)		45.0 %	-5.90 [-13.23, 1.43]
Potempa 1995	19	127.3 (18.31)	23	131.5 (22.54)		36.0 %	-4.20 [-16.55, 8.15]
Subtotal (95% CI)	**65**		**67**			**81.0 %**	**-5.46 [-11.76, 0.85]**
Heterogeneity: Tau^2 = 0.0; Chi^2 = 0.05, df = 1 (P = 0.82); I^2 =0.0%							
Test for overall effect: Z = 1.70 (P = 0.090)							
Total (95% CI)	**71**		**73**			**100.0 %**	**0.83 [-12.50, 14.17]**
Heterogeneity: Tau^2 = 88.79; Chi^2 = 6.17, df = 2 (P = 0.05); I^2 =68%							
Test for overall effect: Z = 0.12 (P = 0.90)							

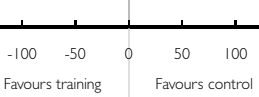
Analysis 1.5. Comparison 1 Cardiorespiratory training versus control - end of intervention, Outcome 5 Adverse events and risk factors - blood pressure, diastolic.

Review: Physical fitness training for stroke patients

Comparison: 1 Cardiorespiratory training versus control - end of intervention

Outcome: 5 Adverse events and risk factors - blood pressure, diastolic

Study or subgroup	Training N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 During usual care							
da Cunha 2002	6	95.33 (9.69)	6	94.33 (10.54)		7.3 %	1.00 [-10.46, 12.46]
Subtotal (95% CI)	**6**		**6**			**7.3 %**	**1.00 [-10.46, 12.46]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.17 (P = 0.86)							
2 After usual care							
Katz-Leurer 2003	46	79 (9.7)	44	80.8 (10.2)		56.7 %	-1.80 [-5.92, 2.32]
Potempa 1995	19	78.4 (9.15)	23	76.4 (7.67)		35.9 %	2.00 [-3.17, 7.17]
Subtotal (95% CI)	**65**		**67**			**92.7 %**	**-0.33 [-3.55, 2.89]**
Heterogeneity: Chi^2 = 1.27, df = 1 (P = 0.26); I^2 =21%							
Test for overall effect: Z = 0.20 (P = 0.84)							
Total (95% CI)	**71**		**73**			**100.0 %**	**-0.23 [-3.33, 2.87]**
Heterogeneity: Chi^2 = 1.32, df = 2 (P = 0.52); I^2 =0.0%							
Test for overall effect: Z = 0.15 (P = 0.88)							
Test for subgroup differences: Chi^2 = 0.05, df = 1 (P = 0.83), I^2 =0.0%							



Analysis 1.6. Comparison 1 Cardiorespiratory training versus control - end of intervention, Outcome 6 Physical fitness - cardiorespiratory, VO2 (ml/kg/min).

Review: Physical fitness training for stroke patients

Comparison: 1 Cardiorespiratory training versus control - end of intervention

Outcome: 6 Physical fitness - cardiorespiratory, VO2 (ml/kg/min)

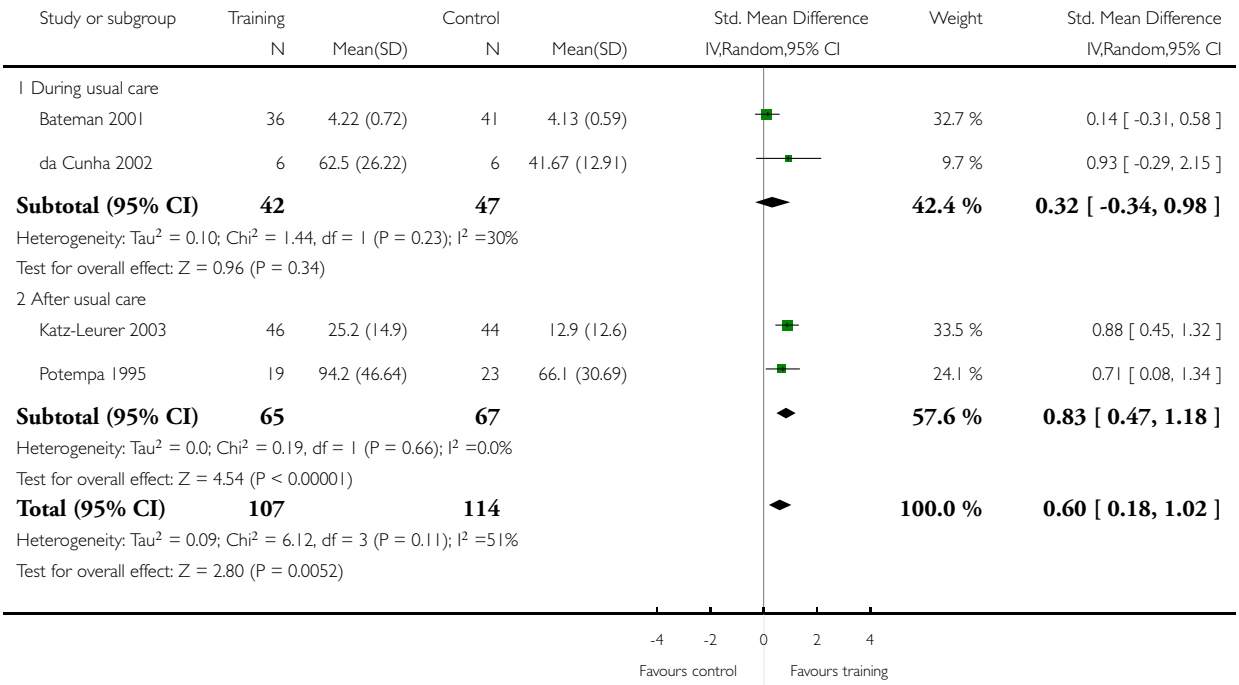
Study or subgroup	Training N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 During usual care							
da Cunha 2002	6	11.55 (2.76)	6	8.12 (2.3)		48.4 %	3.43 [0.56, 6.30]
Subtotal (95% CI)	**6**		**6**			**48.4 %**	**3.43 [0.56, 6.30]**
Heterogeneity: not applicable							
Test for overall effect: Z = 2.34 (P = 0.019)							
2 After usual care							
Potempa 1995	19	18.8 (4.79)	23	15.2 (4.32)		51.6 %	3.60 [0.82, 6.38]
Subtotal (95% CI)	**19**		**23**			**51.6 %**	**3.60 [0.82, 6.38]**
Heterogeneity: not applicable							
Test for overall effect: Z = 2.53 (P = 0.011)							
Total (95% CI)	**25**		**29**			**100.0 %**	**3.52 [1.52, 5.52]**
Heterogeneity: Tau² = 0.0; Chi² = 0.01, df = 1 (P = 0.93); I² =0.0%							
Test for overall effect: Z = 3.45 (P = 0.00057)							

Analysis 1.7. Comparison 1 Cardiorespiratory training versus control - end of intervention, Outcome 7 Physical fitness - cardiorespiratory, maximum cycling work rate (Watts).

Review: Physical fitness training for stroke patients

Comparison: 1 Cardiorespiratory training versus control - end of intervention

Outcome: 7 Physical fitness - cardiorespiratory, maximum cycling work rate (Watts)



Analysis 1.8. Comparison 1 Cardiorespiratory training versus control - end of intervention, Outcome 8 Mobility - functional ambulation categories.

Review: Physical fitness training for stroke patients

Comparison: 1 Cardiorespiratory training versus control - end of intervention

Outcome: 8 Mobility - functional ambulation categories

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 During usual care							
da Cunha 2002	6	2.33 (1.37)	7	1.86 (1.77)		2.4 %	0.47 [-1.24, 2.18]
Pohl 2002a	20	4.6 (0.6)	10	4.3 (0.7)		27.1 %	0.30 [-0.21, 0.81]
Pohl 2002b	20	5 (0.01)	10	4.3 (0.7)		37.1 %	0.70 [0.27, 1.13]
Pohl 2007	77	3.2 (1.4)	78	2.1 (1.5)		33.4 %	1.10 [0.64, 1.56]
Subtotal (95% CI)	**123**		**105**			**100.0 %**	**0.72 [0.46, 0.98]**
Heterogeneity: Chi^2 = 5.38, df = 3 (P = 0.15); I^2 =44%							
Test for overall effect: Z = 5.34 (P < 0.00001)							
2 After usual care							
Subtotal (95% CI)	**0**		**0**			**0.0 %**	**0.0 [0.0, 0.0]**
Heterogeneity: not applicable							
Test for overall effect: not applicable							

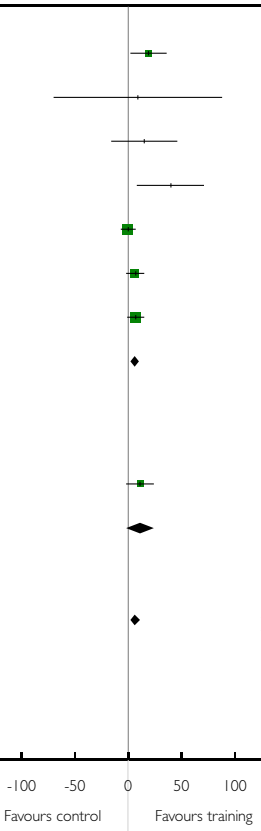
Analysis 1.9. Comparison 1 Cardiorespiratory training versus control - end of intervention, Outcome 9 Mobility - gait speed, maximal (m/min over 5 to 10 metres).

Review: Physical fitness training for stroke patients

Comparison: 1 Cardiorespiratory training versus control - end of intervention

Outcome: 9 Mobility - gait speed, maximal (m/min over 5 to 10 metres)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 During usual care							
da Cunha 2002	6	35.4 (17.4)	7	16.2 (13.8)		5.6 %	19.20 [1.93, 36.47]
Glasser 1986	10	36.07 (118.81)	10	27.07 (46.04)		0.3 %	9.00 [-69.97, 87.97]
Pohl 2002a	20	73.2 (44.4)	10	58.2 (38.4)		1.8 %	15.00 [-15.74, 45.74]
Pohl 2002b	20	97.8 (48)	10	58.2 (38.4)		1.7 %	39.60 [7.84, 71.36]
Bateman 2001	36	16 (11.06)	37	16.22 (19.49)		32.0 %	-0.22 [-7.47, 7.03]
Eich 2004	25	42.6 (18)	25	36 (13.2)		21.9 %	6.60 [-2.15, 15.35]
Pohl 2007	77	26.4 (28.2)	78	19.2 (21.6)		26.8 %	7.20 [-0.72, 15.12]
Subtotal (95% CI)	**194**		**177**			**90.1 %**	**5.93 [1.61, 10.24]**
Heterogeneity: Chi^2 = 9.81, df = 6 (P = 0.13); I^2 =39%							
Test for overall effect: Z = 2.69 (P = 0.0071)							
2 After usual care							
Salbach 2004	44	59.4 (33.6)	47	48 (29.4)		9.9 %	11.40 [-1.61, 24.41]
Subtotal (95% CI)	**44**		**47**			**9.9 %**	**11.40 [-1.61, 24.41]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.72 (P = 0.086)							
Total (95% CI)	**238**		**224**			**100.0 %**	**6.47 [2.37, 10.57]**
Heterogeneity: Chi^2 = 10.43, df = 7 (P = 0.17); I^2 =33%							
Test for overall effect: Z = 3.09 (P = 0.0020)							
Test for subgroup differences: Chi^2 = 0.61, df = 1 (P = 0.43), I^2 =0.0%							



Analysis 1.10. Comparison 1 Cardiorespiratory training versus control - end of intervention, Outcome 10 Mobility - gait speed, maximal (m/min over 5 to 10 metres); subgroup: ACSM.

Review: Physical fitness training for stroke patients

Comparison: 1 Cardiorespiratory training versus control - end of intervention

Outcome: 10 Mobility - gait speed, maximal (m/min over 5 to 10 metres); subgroup: ACSM

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 ACSM criteria met							
Bateman 2001	36	16 (11.06)	37	16.22 (19.49)		32.0 %	-0.22 [-7.47, 7.03]
Eich 2004	25	42.6 (18)	25	36 (13.2)		21.9 %	6.60 [-2.15, 15.35]
Subtotal (95% CI)	**61**		**62**			**53.9 %**	**2.55 [-3.03, 8.13]**
Heterogeneity: Chi^2 = 1.38, df = 1 (P = 0.24); I^2 =28%							
Test for overall effect: Z = 0.90 (P = 0.37)							
2 ACSM criteria unknown							
Glasser 1986	10	36.07 (118.81)	10	27.07 (46.04)		0.3 %	9.00 [-69.97, 87.97]
Pohl 2002a	20	73.2 (44.4)	10	58.2 (38.4)		1.8 %	15.00 [-15.74, 45.74]
Pohl 2002b	20	97.8 (48)	10	58.2 (38.4)		1.7 %	39.60 [7.84, 71.36]
Pohl 2007	77	26.4 (28.2)	78	19.2 (21.6)		26.8 %	7.20 [-0.72, 15.12]
Subtotal (95% CI)	**127**		**108**			**30.5 %**	**9.44 [2.02, 16.86]**
Heterogeneity: Chi^2 = 3.90, df = 3 (P = 0.27); I^2 =23%							
Test for overall effect: Z = 2.49 (P = 0.013)							
3 ACSM criteria not met							
da Cunha 2002	6	35.4 (17.4)	7	16.2 (13.8)		5.6 %	19.20 [1.93, 36.47]
Salbach 2004	44	59.4 (33.6)	47	48 (29.4)		9.9 %	11.40 [-1.61, 24.41]
Subtotal (95% CI)	**50**		**54**			**15.6 %**	**14.22 [3.83, 24.61]**
Heterogeneity: Chi^2 = 0.50, df = 1 (P = 0.48); I^2 =0.0%							
Test for overall effect: Z = 2.68 (P = 0.0073)							
Total (95% CI)	**238**		**224**			**100.0 %**	**6.47 [2.37, 10.57]**
Heterogeneity: Chi^2 = 10.43, df = 7 (P = 0.17); I^2 =33%							
Test for overall effect: Z = 3.09 (P = 0.0020)							
Test for subgroup differences: Chi^2 = 4.64, df = 2 (P = 0.10), I^2 =57%							

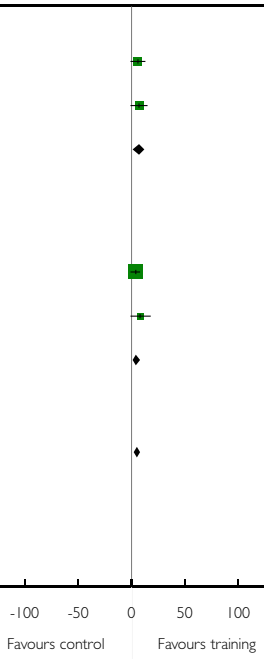
Analysis 1.11. Comparison 1 Cardiorespiratory training versus control - end of intervention, Outcome 11 Mobility - gait speed, preferred (m/min).

Review: Physical fitness training for stroke patients

Comparison: 1 Cardiorespiratory training versus control - end of intervention

Outcome: 11 Mobility - gait speed, preferred (m/min)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 During usual care							
Cuviello-Palmer 1988	10	18.11 (9.22)	10	12.07 (6.41)		19.9 %	6.04 [-0.92, 13.00]
Pohl 2007	77	26.4 (28.2)	78	19.2 (21.6)		15.4 %	7.20 [-0.72, 15.12]
Subtotal (95% CI)	**87**		**88**			**35.2 %**	**6.55 [1.32, 11.77]**
Heterogeneity: Chi^2 = 0.05, df = 1 (P = 0.83); I^2 =0.0%							
Test for overall effect: Z = 2.45 (P = 0.014)							
2 After usual care							
Katz-Leurer 2003	46	30.6 (10.8)	44	27 (9.6)		54.1 %	3.60 [-0.62, 7.82]
Salbach 2004	44	46.8 (24)	47	38.4 (22.2)		10.6 %	8.40 [-1.12, 17.92]
Subtotal (95% CI)	**90**		**91**			**64.8 %**	**4.39 [0.53, 8.24]**
Heterogeneity: Chi^2 = 0.82, df = 1 (P = 0.37); I^2 =0.0%							
Test for overall effect: Z = 2.23 (P = 0.026)							
Total (95% CI)	**177**		**179**			**100.0 %**	**5.15 [2.05, 8.25]**
Heterogeneity: Chi^2 = 1.29, df = 3 (P = 0.73); I^2 =0.0%							
Test for overall effect: Z = 3.25 (P = 0.0011)							
Test for subgroup differences: Chi^2 = 0.42, df = 1 (P = 0.51), I^2 =0.0%							



Analysis 1.12. Comparison 1 Cardiorespiratory training versus control - end of intervention, Outcome 12 Mobility - gait endurance (6-MWT metres).

Review: Physical fitness training for stroke patients

Comparison: 1 Cardiorespiratory training versus control - end of intervention

Outcome: 12 Mobility - gait endurance (6-MWT metres)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 During usual care							
Eich 2004	25	198.8 (81.1)	25	164.4 (69.3)		34.6 %	34.40 [-7.42, 76.22]
Pohl 2007	77	134.4 (125.5)	78	92.5 (104.9)		45.5 %	41.90 [5.46, 78.34]
Subtotal (95% CI)	**102**		**103**			**80.1 %**	**38.66 [11.19, 66.13]**
Heterogeneity: Chi^2 = 0.07, df = 1 (P = 0.79); I^2 =0.0%							
Test for overall effect: Z = 2.76 (P = 0.0058)							
2 After usual care							
Salbach 2004	44	249 (136)	47	209 (132)		19.9 %	40.00 [-15.13, 95.13]
Subtotal (95% CI)	**44**		**47**			**19.9 %**	**40.00 [-15.13, 95.13]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.42 (P = 0.15)							
Total (95% CI)	**146**		**150**			**100.0 %**	**38.93 [14.34, 63.52]**
Heterogeneity: Chi^2 = 0.07, df = 2 (P = 0.96); I^2 =0.0%							
Test for overall effect: Z = 3.10 (P = 0.0019)							
Test for subgroup differences: Chi^2 = 0.00, df = 1 (P = 0.97), I^2 =0.0%							

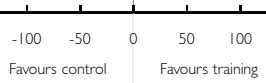
Analysis 1.13. Comparison 1 Cardiorespiratory training versus control - end of intervention, Outcome 13 Mobility - gait endurance (m/min).

Review: Physical fitness training for stroke patients

Comparison: 1 Cardiorespiratory training versus control - end of intervention

Outcome: 13 Mobility - gait endurance (m/min)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 During usual care							
da Cunha 2002	6	34.17 (17.17)	7	12.14 (10.87)		6.2 %	22.03 [6.11, 37.95]
Eich 2004	25	33.13 (13.52)	25	27.4 (11.55)		32.5 %	5.73 [-1.24, 12.70]
Pohl 2007	77	22.4 (20.92)	78	15.42 (17.48)		42.8 %	6.98 [0.91, 13.05]
Subtotal (95% CI)	**108**		**110**			**81.6 %**	**7.63 [3.23, 12.03]**
Heterogeneity: Chi^2 = 3.47, df = 2 (P = 0.18); I^2 =42%							
Test for overall effect: Z = 3.40 (P = 0.00068)							
2 After usual care							
Salbach 2004	44	41.4 (22.8)	47	34.8 (22.2)		18.4 %	6.60 [-2.66, 15.86]
Subtotal (95% CI)	**44**		**47**			**18.4 %**	**6.60 [-2.66, 15.86]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.40 (P = 0.16)							
Total (95% CI)	**152**		**157**			**100.0 %**	**7.44 [3.47, 11.42]**
Heterogeneity: Chi^2 = 3.51, df = 3 (P = 0.32); I^2 =15%							
Test for overall effect: Z = 3.67 (P = 0.00024)							
Test for subgroup differences: Chi^2 = 0.04, df = 1 (P = 0.84), I^2 =0.0%							

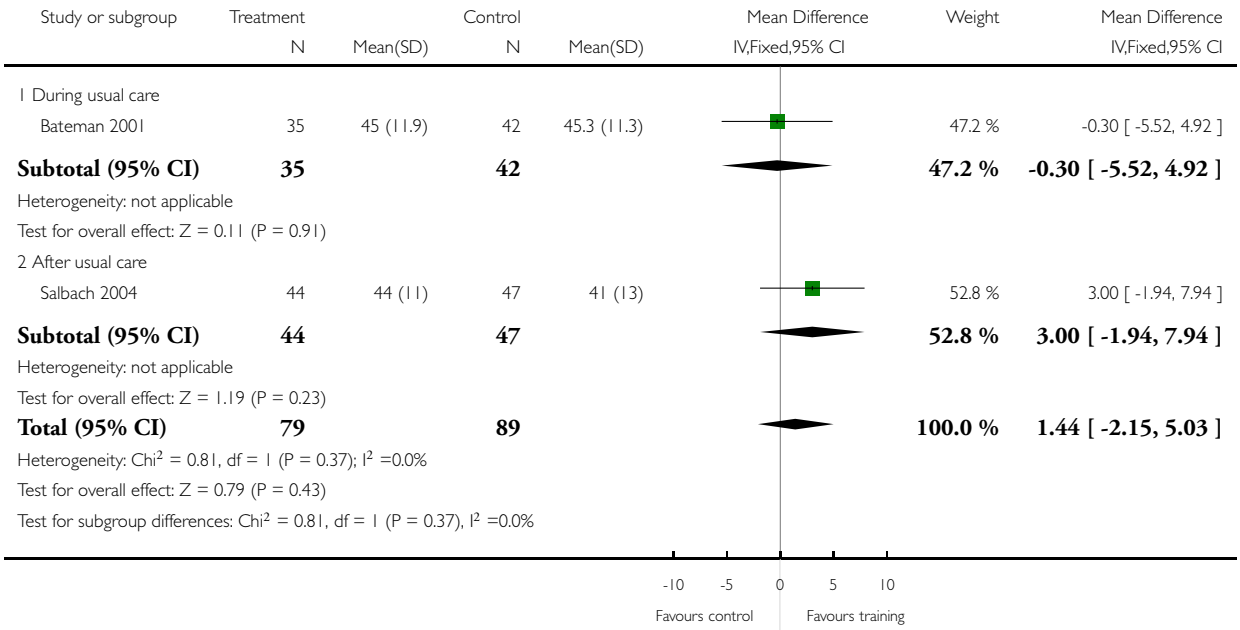


Analysis 1.14. Comparison 1 Cardiorespiratory training versus control - end of intervention, Outcome 14 Physical function - Berg Balance scale.

Review: Physical fitness training for stroke patients

Comparison: 1 Cardiorespiratory training versus control - end of intervention

Outcome: 14 Physical function - Berg Balance scale



Analysis 2.1. Comparison 2 Cardiorespiratory training versus control - end of retention follow up, Outcome 1 Disability - Rivermead Mobility Index.

Review: Physical fitness training for stroke patients

Comparison: 2 Cardiorespiratory training versus control - end of retention follow up

Outcome: 1 Disability - Rivermead Mobility Index

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 During usual care							
Bateman 2001	32	10.72 (3.3)	34	10.97 (3.35)		47.8 %	-0.25 [-1.85, 1.35]
Pohl 2007	77	10 (4.1)	78	7.8 (4.8)		52.2 %	2.20 [0.80, 3.60]
Subtotal (95% CI)	**109**		**112**			**100.0 %**	**1.01 [-1.39, 3.41]**
Heterogeneity: $Tau^2 = 2.41$; $Chi^2 = 5.07$, df = 1 (P = 0.02); $I^2 = 80\%$							
Test for overall effect: Z = 0.82 (P = 0.41)							
2 During usual care - LOCF Bateman							
Bateman 2001	40	10.45 (3.57)	44	10.41 (3.49)		48.8 %	0.04 [-1.47, 1.55]
Pohl 2007	77	10 (4.1)	78	7.8 (4.8)		51.2 %	2.20 [0.80, 3.60]
Subtotal (95% CI)	**117**		**122**			**100.0 %**	**1.14 [-0.98, 3.26]**
Heterogeneity: $Tau^2 = 1.78$; $Chi^2 = 4.21$, df = 1 (P = 0.04); $I^2 = 76\%$							
Test for overall effect: Z = 1.05 (P = 0.29)							
3 After usual care							
Subtotal (95% CI)	**0**		**0**			**0.0 %**	**0.0 [0.0, 0.0]**
Heterogeneity: not applicable							
Test for overall effect: not applicable							

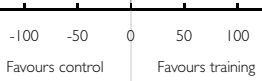
Analysis 2.2. Comparison 2 Cardiorespiratory training versus control - end of retention follow up, Outcome 2 Mobility - gait speed, maximal (m/min).

Review: Physical fitness training for stroke patients

Comparison: 2 Cardiorespiratory training versus control - end of retention follow up

Outcome: 2 Mobility - gait speed, maximal (m/min)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 During usual care							
Bateman 2001	39	21.04 (12.31)	40	15 (21.86)		34.7 %	6.04 [-1.76, 13.84]
Eich 2004	24	46.2 (21)	25	34.8 (13.2)		21.7 %	11.40 [1.53, 21.27]
Pohl 2007	77	31.8 (18.6)	78	21.6 (25.2)		43.5 %	10.20 [3.23, 17.17]
Subtotal (95% CI)	**140**		**143**			**100.0 %**	**9.01 [4.42, 13.61]**
Heterogeneity: Chi^2 = 0.89, df = 2 (P = 0.64); I^2 =0.0%							
Test for overall effect: Z = 3.84 (P = 0.00012)							
2 After usual care							
Subtotal (95% CI)	**0**		**0**			**0.0 %**	**0.0 [0.0, 0.0]**
Heterogeneity: not applicable							
Test for overall effect: not applicable							
Total (95% CI)	**140**		**143**			**100.0 %**	**9.01 [4.42, 13.61]**
Heterogeneity: Chi^2 = 0.89, df = 2 (P = 0.64); I^2 =0.0%							
Test for overall effect: Z = 3.84 (P = 0.00012)							



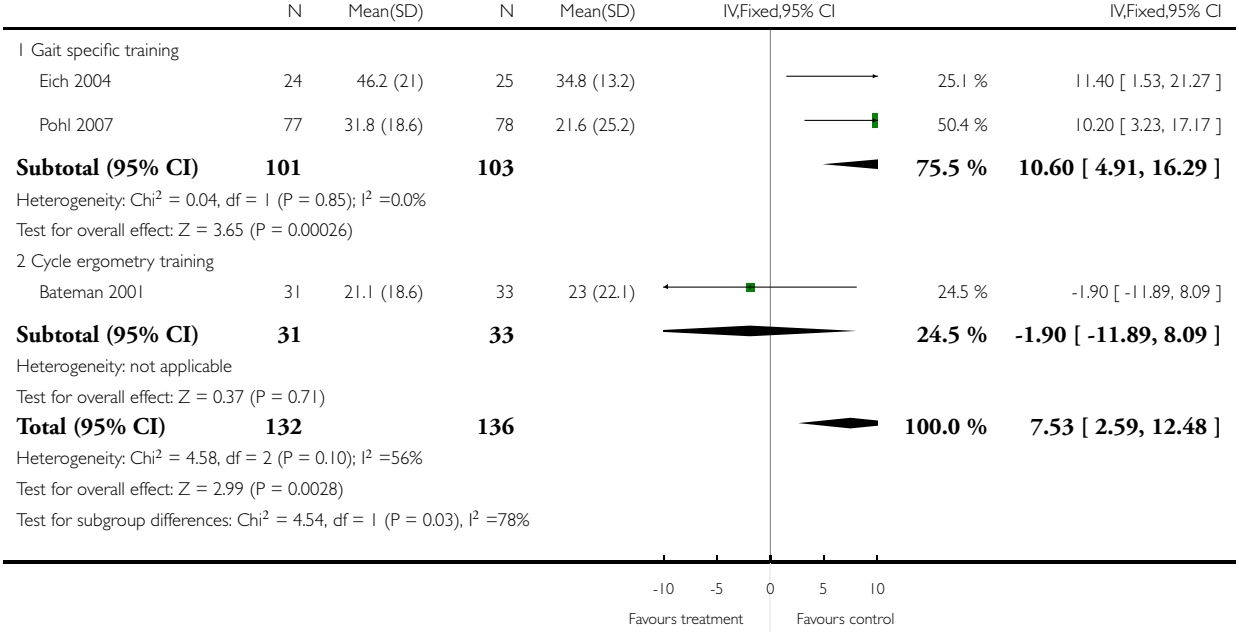
Analysis 2.3. Comparison 2 Cardiorespiratory training versus control - end of retention follow up, Outcome 3 Mobility - gait speed, maximal (m/min); subgroup: specificity.

Review: Physical fitness training for stroke patients

Comparison: 2 Cardiorespiratory training versus control - end of retention follow up

Outcome: 3 Mobility - gait speed, maximal (m/min); subgroup: specificity

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 Gait specific training							
Eich 2004	24	46.2 (21)	25	34.8 (13.2)		25.1 %	11.40 [1.53, 21.27]
Pohl 2007	77	31.8 (18.6)	78	21.6 (25.2)		50.4 %	10.20 [3.23, 17.17]
Subtotal (95% CI)	**101**		**103**			**75.5 %**	**10.60 [4.91, 16.29]**
Heterogeneity: Chi^2 = 0.04, df = 1 (P = 0.85); I^2 =0.0%							
Test for overall effect: Z = 3.65 (P = 0.00026)							
2 Cycle ergometry training							
Bateman 2001	31	21.1 (18.6)	33	23 (22.1)		24.5 %	-1.90 [-11.89, 8.09]
Subtotal (95% CI)	**31**		**33**			**24.5 %**	**-1.90 [-11.89, 8.09]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.37 (P = 0.71)							
Total (95% CI)	**132**		**136**			**100.0 %**	**7.53 [2.59, 12.48]**
Heterogeneity: Chi^2 = 4.58, df = 2 (P = 0.10); I^2 =56%							
Test for overall effect: Z = 2.99 (P = 0.0028)							
Test for subgroup differences: Chi^2 = 4.54, df = 1 (P = 0.03), I^2 =78%							



Analysis 2.4. Comparison 2 Cardiorespiratory training versus control - end of retention follow up, Outcome 4 Mobility - gait endurance (6-MWT metres).

Review: Physical fitness training for stroke patients

Comparison: 2 Cardiorespiratory training versus control - end of retention follow up

Outcome: 4 Mobility - gait endurance (6-MWT metres)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 During usual care							
Eich 2004	24	224.8 (90)	25	163 (70.2)		48.9 %	61.80 [16.48, 107.12]
Pohl 2007	77	165.5 (152.5)	78	112.1 (127.7)		51.1 %	53.40 [9.09, 97.71]
Subtotal (95% CI)	**101**		**103**			**100.0 %**	**57.51 [25.82, 89.19]**
Heterogeneity: Chi^2 = 0.07, df = 1 (P = 0.80); I^2 =0.0%							
Test for overall effect: Z = 3.56 (P = 0.00037)							
2 After usual care							
Subtotal (95% CI)	**0**		**0**			**0.0 %**	**0.0 [0.0, 0.0]**
Heterogeneity: not applicable							
Test for overall effect: not applicable							
Total (95% CI)	**101**		**103**			**100.0 %**	**57.51 [25.82, 89.19]**
Heterogeneity: Chi^2 = 0.07, df = 1 (P = 0.80); I^2 =0.0%							
Test for overall effect: Z = 3.56 (P = 0.00037)							

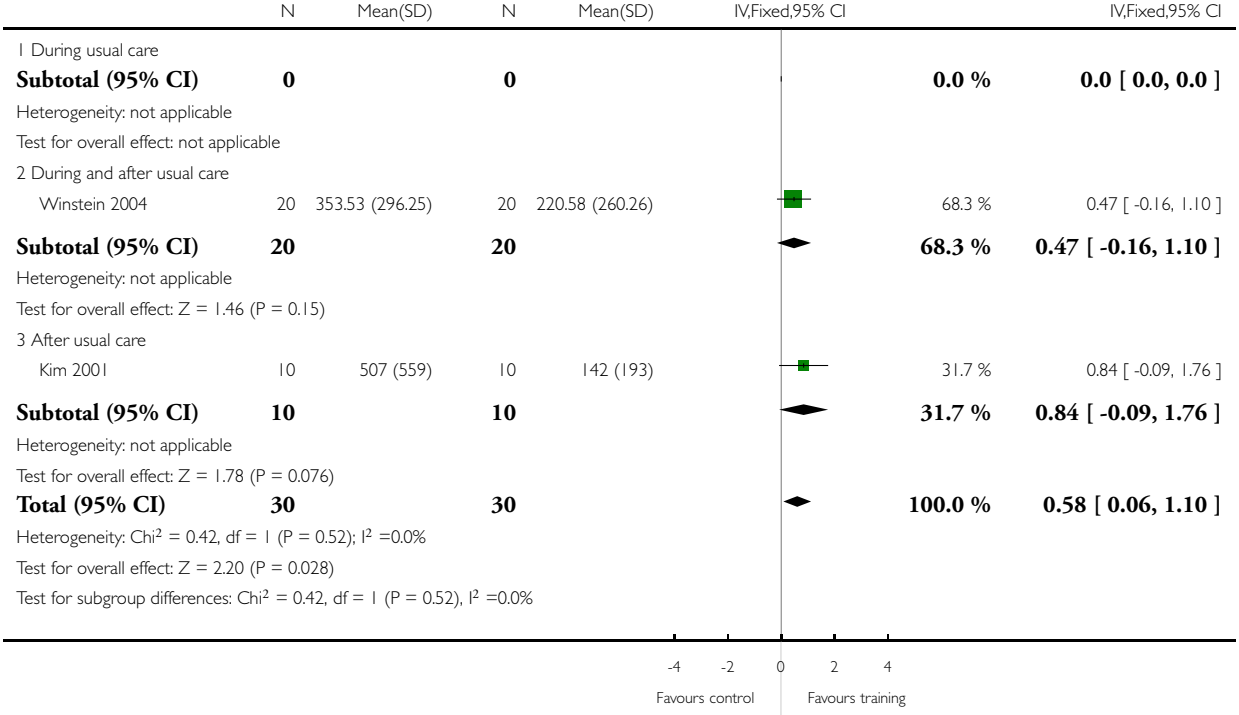
Analysis 3.1. Comparison 3 Strength training versus control - end of intervention, Outcome 1 Physical fitness - muscle strength.

Review: Physical fitness training for stroke patients

Comparison: 3 Strength training versus control - end of intervention

Outcome: 1 Physical fitness - muscle strength

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Fixed,95% CI	Weight	Std. Mean Difference IV,Fixed,95% CI
1 During usual care							
Subtotal (95% CI)	**0**		**0**			**0.0 %**	**0.0 [0.0, 0.0]**
Heterogeneity: not applicable							
Test for overall effect: not applicable							
2 During and after usual care							
Winstein 2004	20	353.53 (296.25)	20	220.58 (260.26)		68.3 %	0.47 [-0.16, 1.10]
Subtotal (95% CI)	**20**		**20**			**68.3 %**	**0.47 [-0.16, 1.10]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.46 (P = 0.15)							
3 After usual care							
Kim 2001	10	507 (559)	10	142 (193)		31.7 %	0.84 [-0.09, 1.76]
Subtotal (95% CI)	**10**		**10**			**31.7 %**	**0.84 [-0.09, 1.76]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.78 (P = 0.076)							
Total (95% CI)	**30**		**30**			**100.0 %**	**0.58 [0.06, 1.10]**
Heterogeneity: Chi^2 = 0.42, df = 1 (P = 0.52); I^2 =0.0%							
Test for overall effect: Z = 2.20 (P = 0.028)							
Test for subgroup differences: Chi^2 = 0.42, df = 1 (P = 0.52), I^2 =0.0%							



Analysis 3.2. Comparison 3 Strength training versus control - end of intervention, Outcome 2 Mobility - gait speed, maximal (m/min).

Review: Physical fitness training for stroke patients

Comparison: 3 Strength training versus control - end of intervention

Outcome: 2 Mobility - gait speed, maximal (m/min)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 During usual care							
Subtotal (95% CI)	**0**		**0**			**0.0 %**	**0.0 [0.0, 0.0]**
Heterogeneity: not applicable							
Test for overall effect: not applicable							
2 After usual care							
Kim 2001	10	3 (5.4)	10	4.2 (4.8)		94.8 %	-1.20 [-5.68, 3.28]
Ouellette 2004	21	51.6 (30.24)	21	52.2 (32.99)		5.2 %	-0.60 [-19.74, 18.54]
Subtotal (95% CI)	**31**		**31**			**100.0 %**	**-1.17 [-5.53, 3.19]**
Heterogeneity: Chi^2 = 0.00, df = 1 (P = 0.95); I^2 =0.0%							
Test for overall effect: Z = 0.53 (P = 0.60)							
Total (95% CI)	**31**		**31**			**100.0 %**	**-1.17 [-5.53, 3.19]**
Heterogeneity: Chi^2 = 0.00, df = 1 (P = 0.95); I^2 =0.0%							
Test for overall effect: Z = 0.53 (P = 0.60)							

Analysis 3.3. Comparison 3 Strength training versus control - end of intervention, Outcome 3 Mobility - gait speed, preferred (m/min).

Review: Physical fitness training for stroke patients

Comparison: 3 Strength training versus control - end of intervention

Outcome: 3 Mobility - gait speed, preferred (m/min)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 During usual care							
Subtotal (95% CI)	**0**		**0**			**0.0 %**	**0.0 [0.0, 0.0]**
Heterogeneity: not applicable							
Test for overall effect: not applicable							
2 After usual care							
Kim 2001	10	2.4 (7.8)	10	5.4 (4.2)		68.3 %	-3.00 [-8.49, 2.49]
Ouellette 2004	21	38.4 (22)	21	38.4 (24.75)		31.7 %	0.0 [-14.16, 14.16]
Subtotal (95% CI)	**31**		**31**			**100.0 %**	**-2.61 [-7.73, 2.51]**
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 0.15$, df = 1 (P = 0.70); $I^2 = 0.0\%$							
Test for overall effect: Z = 1.00 (P = 0.32)							
3 After usual care - sensitivity analysis							
Kim 2001	10	2.4 (7.8)	10	5.4 (4.2)		39.9 %	-3.00 [-8.49, 2.49]
Ouellette 2004	21	38.4 (22)	21	38.4 (24.75)		18.5 %	0.0 [-14.16, 14.16]
Yang 2006	24	55.5 (8.1)	24	46.62 (9.24)		41.6 %	8.88 [3.96, 13.80]
Subtotal (95% CI)	**55**		**55**			**100.0 %**	**2.37 [-6.80, 11.53]**
Heterogeneity: $Tau^2 = 48.75$; $Chi^2 = 10.21$, df = 2 (P = 0.01); $I^2 = 80\%$							
Test for overall effect: Z = 0.51 (P = 0.61)							

Analysis 3.4. Comparison 3 Strength training versus control - end of intervention, Outcome 4 Mobility - gait endurance (6-MWT metres).

Review: Physical fitness training for stroke patients

Comparison: 3 Strength training versus control - end of intervention

Outcome: 4 Mobility - gait endurance (6-MWT metres)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 During usual care							
Subtotal (95% CI)	**0**		**0**			**0.0 %**	**0.0 [0.0, 0.0]**
Heterogeneity: not applicable							
Test for overall effect: not applicable							
2 After usual care							
Ouellette 2004	21	239.1 (138.85)	21	234.8 (169.1)		25.8 %	4.30 [-89.28, 97.88]
Yang 2006	24	392.8 (54.2)	24	341.3 (126.8)		74.2 %	51.50 [-3.67, 106.67]
Subtotal (95% CI)	**45**		**45**			**100.0 %**	**39.33 [-8.20, 86.85]**
Heterogeneity: Chi^2 = 0.73, df = 1 (P = 0.39); I^2 =0.0%							
Test for overall effect: Z = 1.62 (P = 0.10)							
Total (95% CI)	**45**		**45**			**100.0 %**	**39.33 [-8.20, 86.85]**
Heterogeneity: Chi^2 = 0.73, df = 1 (P = 0.39); I^2 =0.0%							
Test for overall effect: Z = 1.62 (P = 0.10)							

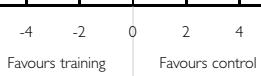
Analysis 3.5. Comparison 3 Strength training versus control - end of intervention, Outcome 5 Physical function - stair climbing, maximal (sec/step).

Review: Physical fitness training for stroke patients

Comparison: 3 Strength training versus control - end of intervention

Outcome: 5 Physical function - stair climbing, maximal (sec/step)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Fixed,95% CI	Weight	Std. Mean Difference IV,Fixed,95% CI
1 During usual care							
Subtotal (95% CI)	**0**		**0**			**0.0 %**	**0.0 [0.0, 0.0]**
Heterogeneity: not applicable							
Test for overall effect: not applicable							
2 After usual care							
Kim 2001	10	0.03 (0.08)	10	0.08 (0.1)		32.2 %	-0.53 [-1.42, 0.37]
Ouellette 2004	20	0.65 (0.41)	21	0.53 (0.34)		67.8 %	0.31 [-0.30, 0.93]
Subtotal (95% CI)	**30**		**31**			**100.0 %**	**0.04 [-0.47, 0.55]**
Heterogeneity: Chi^2 = 2.30, df = 1 (P = 0.13); I^2 =57%							
Test for overall effect: Z = 0.16 (P = 0.87)							
Total (95% CI)	**30**		**31**			**100.0 %**	**0.04 [-0.47, 0.55]**
Heterogeneity: Chi^2 = 2.30, df = 1 (P = 0.13); I^2 =57%							
Test for overall effect: Z = 0.16 (P = 0.87)							



Analysis 5.1. Comparison 5 Mixed training versus control - end of intervention, Outcome 1 Disability - Lawton IADL.

Review: Physical fitness training for stroke patients

Comparison: 5 Mixed training versus control - end of intervention

Outcome: 1 Disability - Lawton IADL

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 During usual care							
Subtotal (95% CI)	**0**		**0**			**0.0 %**	**0.0 [0.0, 0.0]**
Heterogeneity: not applicable							
Test for overall effect: not applicable							
2 After usual care							
Duncan 1998	10	22 (4.24)	10	22.2 (3.82)		14.3 %	-0.20 [-3.74, 3.34]
Duncan 2003	44	22.8 (3.2)	49	21.8 (3.9)		85.7 %	1.00 [-0.44, 2.44]
Subtotal (95% CI)	**54**		**59**			**100.0 %**	**0.83 [-0.51, 2.17]**
Heterogeneity: Chi^2 = 0.38, df = 1 (P = 0.54); I^2 =0.0%							
Test for overall effect: Z = 1.21 (P = 0.22)							

Analysis 5.2. Comparison 5 Mixed training versus control - end of intervention, Outcome 2 Disability - Barthel ADL.

Review: Physical fitness training for stroke patients

Comparison: 5 Mixed training versus control - end of intervention

Outcome: 2 Disability - Barthel ADL

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 During usual care							
Subtotal (95% CI)	**0**		**0**			**0.0 %**	**0.0 [0.0, 0.0]**
Heterogeneity: not applicable							
Test for overall effect: not applicable							
2 After usual care							
Duncan 1998	10	96 (5.16)	10	95.56 (5.27)		44.2 %	0.44 [-4.13, 5.01]
Duncan 2003	44	94.4 (6.7)	49	89.6 (10.4)		55.8 %	4.80 [1.28, 8.32]
Subtotal (95% CI)	**54**		**59**			**100.0 %**	**2.87 [-1.37, 7.12]**
Heterogeneity: $Tau^2 = 5.17$; $Chi^2 = 2.19$, df = 1 (P = 0.14); $I^2 = 54\%$							
Test for overall effect: Z = 1.33 (P = 0.18)							

Analysis 5.3. Comparison 5 Mixed training versus control - end of intervention, Outcome 3 Disability - Barthel ADL ambulation subscale.

Review: Physical fitness training for stroke patients

Comparison: 5 Mixed training versus control - end of intervention

Outcome: 3 Disability - Barthel ADL ambulation subscale

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 During usual care							
Richards 1993	9	25.8 (14.8)	8	26.8 (18.5)		6.1 %	-1.00 [-17.06, 15.06]
Richards 2004	31	37 (8)	31	39 (8.5)		93.9 %	-2.00 [-6.11, 2.11]
Subtotal (95% CI)	**40**		**39**			**100.0 %**	**-1.94 [-5.92, 2.04]**
Heterogeneity: Chi^2 = 0.01, df = 1 (P = 0.91); I^2 =0.0%							
Test for overall effect: Z = 0.95 (P = 0.34)							
2 After usual care							
Subtotal (95% CI)	**0**		**0**			**0.0 %**	**0.0 [0.0, 0.0]**
Heterogeneity: not applicable							
Test for overall effect: not applicable							

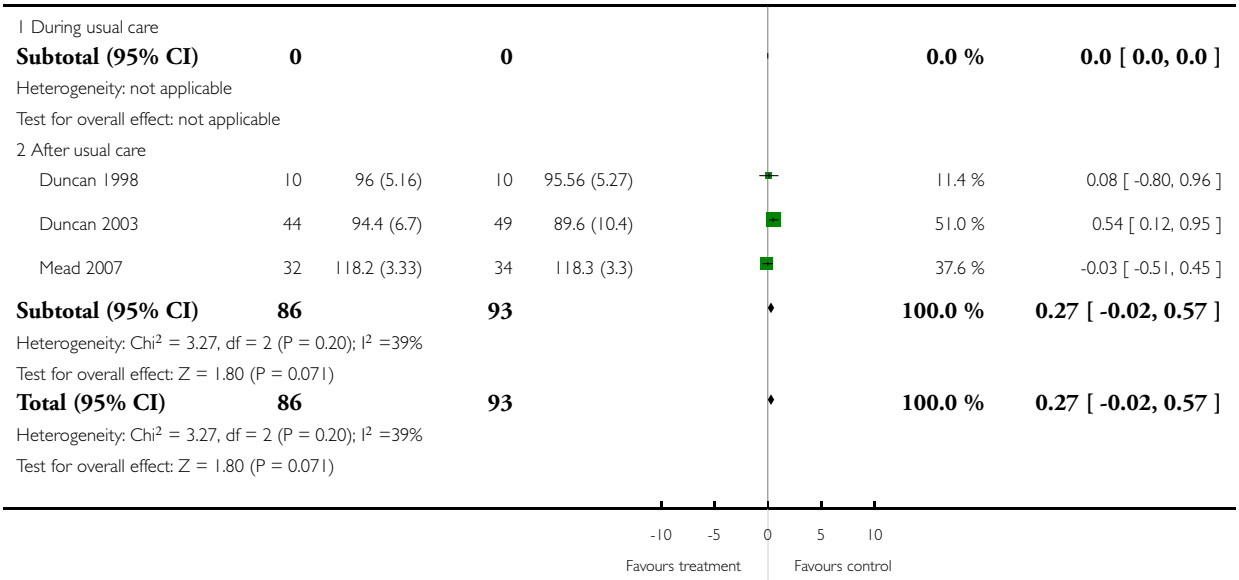
Analysis 5.4. Comparison 5 Mixed training versus control - end of intervention, Outcome 4 Disability - Barthel & FIM Instrument.

Review: Physical fitness training for stroke patients

Comparison: 5 Mixed training versus control - end of intervention

Outcome: 4 Disability - Barthel % FIM Instrument

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Fixed,95% CI	Weight	Std. Mean Difference IV,Fixed,95% CI
1 During usual care							
Subtotal (95% CI)	**0**		**0**			**0.0 %**	**0.0 [0.0, 0.0]**
Heterogeneity: not applicable							
Test for overall effect: not applicable							
2 After usual care							
Duncan 1998	10	96 (5.16)	10	95.56 (5.27)		11.4 %	0.08 [-0.80, 0.96]
Duncan 2003	44	94.4 (6.7)	49	89.6 (10.4)		51.0 %	0.54 [0.12, 0.95]
Mead 2007	32	118.2 (3.33)	34	118.3 (3.3)		37.6 %	-0.03 [-0.51, 0.45]
Subtotal (95% CI)	**86**		**93**			**100.0 %**	**0.27 [-0.02, 0.57]**
Heterogeneity: Chi^2 = 3.27, df = 2 (P = 0.20); I^2 =39%							
Test for overall effect: Z = 1.80 (P = 0.071)							
Total (95% CI)	**86**		**93**			**100.0 %**	**0.27 [-0.02, 0.57]**
Heterogeneity: Chi^2 = 3.27, df = 2 (P = 0.20); I^2 =39%							
Test for overall effect: Z = 1.80 (P = 0.071)							

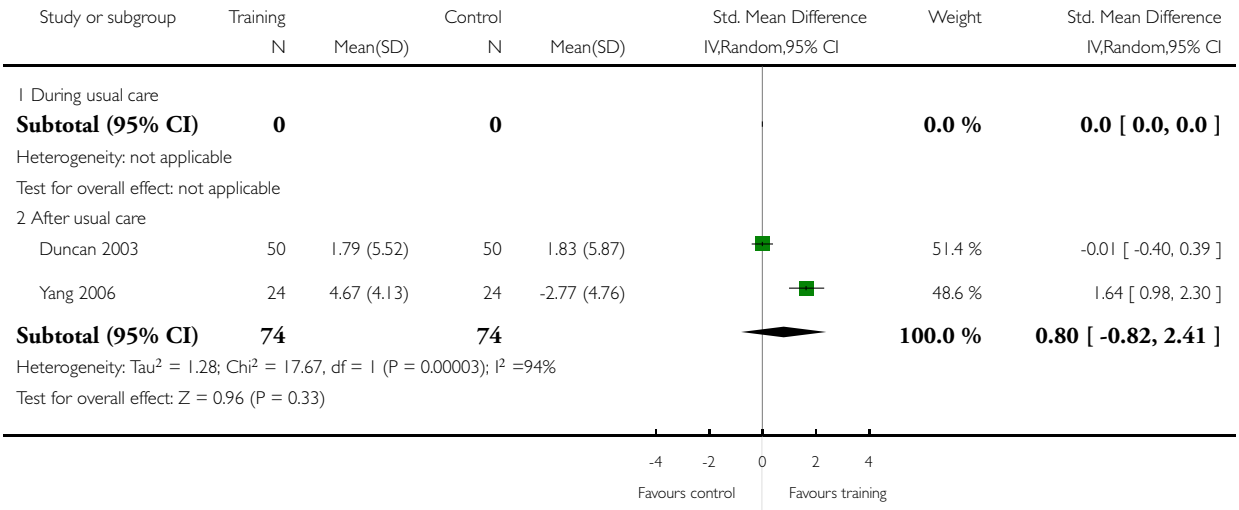


Analysis 5.5. Comparison 5 Mixed training versus control - end of intervention, Outcome 5 Physical fitness - strength, ankle dorsiflexion*.

Review: Physical fitness training for stroke patients

Comparison: 5 Mixed training versus control - end of intervention

Outcome: 5 Physical fitness - strength, ankle dorsiflexion*



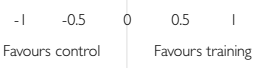
Analysis 5.6. Comparison 5 Mixed training versus control - end of intervention, Outcome 6 Physical fitness - strength, knee extension*.

Review: Physical fitness training for stroke patients

Comparison: 5 Mixed training versus control - end of intervention

Outcome: 6 Physical fitness - strength, knee extension*

Study or subgroup	Training N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Fixed,95% CI	Weight	Std. Mean Difference IV,Fixed,95% CI
1 During usual care							
Subtotal (95% CI)	**0**		**0**			**0.0 %**	**0.0 [0.0, 0.0]**
Heterogeneity: not applicable							
Test for overall effect: not applicable							
2 After usual care							
Duncan 2003	50	7.71 (16.4)	50	4.12 (16.8)		68.5 %	0.21 [-0.18, 0.61]
Yang 2006	24	4.49 (5.44)	24	1.09 (5.44)		31.5 %	0.61 [0.03, 1.19]
Subtotal (95% CI)	**74**		**74**			**100.0 %**	**0.34 [0.02, 0.67]**
Heterogeneity: Chi^2 = 1.25, df = 1 (P = 0.26); I^2 =20%							
Test for overall effect: Z = 2.05 (P = 0.040)							



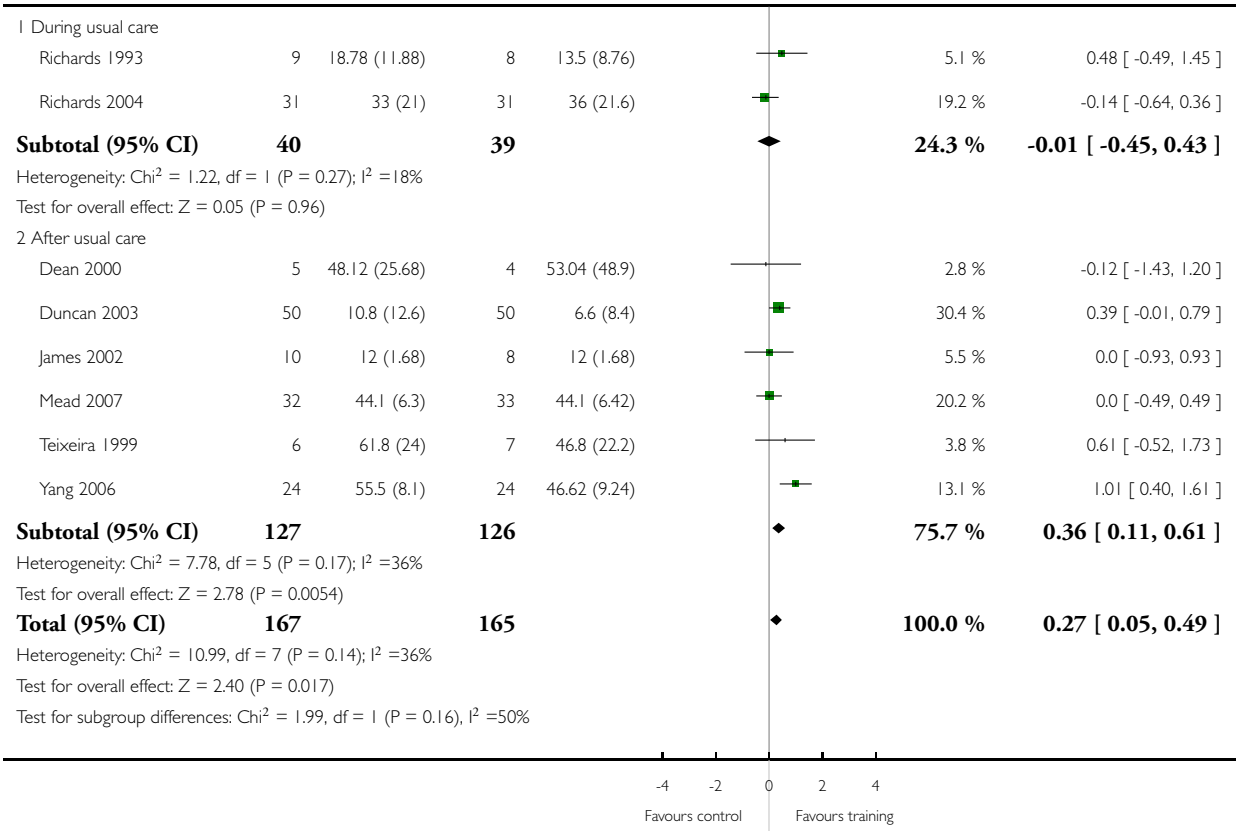
Analysis 5.7. Comparison 5 Mixed training versus control - end of intervention, Outcome 7 Mobility - gait preferred speed (m/min).

Review: Physical fitness training for stroke patients

Comparison: 5 Mixed training versus control - end of intervention

Outcome: 7 Mobility - gait preferred speed (m/min)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Fixed,95% CI	Weight	Std. Mean Difference IV,Fixed,95% CI
1 During usual care							
Richards 1993	9	18.78 (11.88)	8	13.5 (8.76)		5.1 %	0.48 [-0.49, 1.45]
Richards 2004	31	33 (21)	31	36 (21.6)		19.2 %	-0.14 [-0.64, 0.36]
Subtotal (95% CI)	**40**		**39**			**24.3 %**	**-0.01 [-0.45, 0.43]**
Heterogeneity: Chi^2 = 1.22, df = 1 (P = 0.27); I^2 =18%							
Test for overall effect: Z = 0.05 (P = 0.96)							
2 After usual care							
Dean 2000	5	48.12 (25.68)	4	53.04 (48.9)		2.8 %	-0.12 [-1.43, 1.20]
Duncan 2003	50	10.8 (12.6)	50	6.6 (8.4)		30.4 %	0.39 [-0.01, 0.79]
James 2002	10	12 (1.68)	8	12 (1.68)		5.5 %	0.0 [-0.93, 0.93]
Mead 2007	32	44.1 (6.3)	33	44.1 (6.42)		20.2 %	0.0 [-0.49, 0.49]
Teixeira 1999	6	61.8 (24)	7	46.8 (22.2)		3.8 %	0.61 [-0.52, 1.73]
Yang 2006	24	55.5 (8.1)	24	46.62 (9.24)		13.1 %	1.01 [0.40, 1.61]
Subtotal (95% CI)	**127**		**126**			**75.7 %**	**0.36 [0.11, 0.61]**
Heterogeneity: Chi^2 = 7.78, df = 5 (P = 0.17); I^2 =36%							
Test for overall effect: Z = 2.78 (P = 0.0054)							
Total (95% CI)	**167**		**165**			**100.0 %**	**0.27 [0.05, 0.49]**
Heterogeneity: Chi^2 = 10.99, df = 7 (P = 0.14); I^2 =36%							
Test for overall effect: Z = 2.40 (P = 0.017)							
Test for subgroup differences: Chi^2 = 1.99, df = 1 (P = 0.16), I^2 =50%							



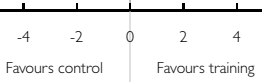
Analysis 5.8. Comparison 5 Mixed training versus control - end of intervention, Outcome 8 Mobility - gait preferred speed (m/min); subgroup: therapy time.

Review: Physical fitness training for stroke patients

Comparison: 5 Mixed training versus control - end of intervention

Outcome: 8 Mobility - gait preferred speed (m/min); subgroup: therapy time

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Fixed,95% CI	Weight	Std. Mean Difference IV,Fixed,95% CI
1 Confounded							
Duncan 2003	50	10.8 (12.6)	50	6.6 (8.4)		30.4 %	0.39 [-0.01, 0.79]
James 2002	10	12 (1.68)	8	12 (1.68)		5.5 %	0.0 [-0.93, 0.93]
Richards 1993	9	18.78 (11.88)	8	13.5 (8.76)		5.1 %	0.48 [-0.49, 1.45]
Teixeira 1999	6	61.8 (24)	7	46.8 (22.2)		3.8 %	0.61 [-0.52, 1.73]
Yang 2006	24	55.5 (8.1)	24	46.62 (9.24)		13.1 %	1.01 [0.40, 1.61]
Subtotal (95% CI)	**99**		**97**			**57.9 %**	**0.51 [0.23, 0.80]**
Heterogeneity: Chi^2 = 4.13, df = 4 (P = 0.39); I^2 =3%							
Test for overall effect: Z = 3.50 (P = 0.00046)							
2 Unconfounded							
Dean 2000	5	48.12 (25.68)	4	53.04 (48.9)		2.8 %	-0.12 [-1.43, 1.20]
Mead 2007	32	44.1 (6.3)	33	44.1 (6.42)		20.2 %	0.0 [-0.49, 0.49]
Richards 2004	31	33 (21)	31	36 (21.6)		19.2 %	-0.14 [-0.64, 0.36]
Subtotal (95% CI)	**68**		**68**			**42.1 %**	**-0.07 [-0.41, 0.27]**
Heterogeneity: Chi^2 = 0.16, df = 2 (P = 0.92); I^2 =0.0%							
Test for overall effect: Z = 0.41 (P = 0.68)							
Total (95% CI)	**167**		**165**			**100.0 %**	**0.27 [0.05, 0.49]**
Heterogeneity: Chi^2 = 10.99, df = 7 (P = 0.14); I^2 =36%							
Test for overall effect: Z = 2.40 (P = 0.017)							
Test for subgroup differences: Chi^2 = 6.70, df = 1 (P = 0.01), I^2 =85%							



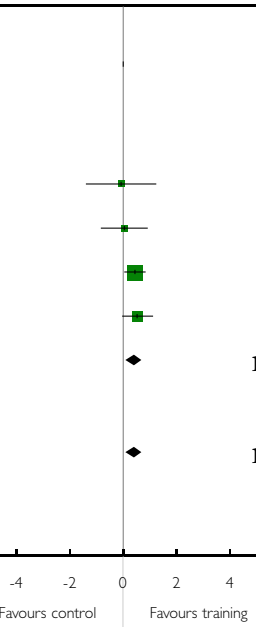
Analysis 5.9. Comparison 5 Mixed training versus control - end of intervention, Outcome 9 Mobility - gait endurance (6 MWT metres).

Review: Physical fitness training for stroke patients

Comparison: 5 Mixed training versus control - end of intervention

Outcome: 9 Mobility - gait endurance (6 MWT metres)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Fixed,95% CI	Weight	Std. Mean Difference IV,Fixed,95% CI
1 During usual care							
Subtotal (95% CI)	**0**		**0**			**0.0 %**	**0.0 [0.0, 0.0]**
Heterogeneity: not applicable							
Test for overall effect: not applicable							
2 After usual care							
Dean 2000	5	250 (135)	4	264.3 (159.1)		5.1 %	-0.09 [-1.40, 1.23]
Duncan 1998	10	209.09 (110.58)	10	204.45 (121.43)		11.6 %	0.04 [-0.84, 0.91]
Duncan 2003	50	61.61 (70.5)	50	33.59 (51.8)		56.5 %	0.45 [0.05, 0.85]
Yang 2006	24	392.8 (54.2)	24	341.3 (126.8)		26.8 %	0.52 [-0.06, 1.10]
Subtotal (95% CI)	**89**		**88**			**100.0 %**	**0.39 [0.09, 0.69]**
Heterogeneity: Chi^2 = 1.40, df = 3 (P = 0.70); I^2 =0.0%							
Test for overall effect: Z = 2.58 (P = 0.0098)							
Total (95% CI)	**89**		**88**			**100.0 %**	**0.39 [0.09, 0.69]**
Heterogeneity: Chi^2 = 1.40, df = 3 (P = 0.70); I^2 =0.0%							
Test for overall effect: Z = 2.58 (P = 0.0098)							



Analysis 5.10. Comparison 5 Mixed training versus control - end of intervention, Outcome 10 Physical function - Fugl-Meyer lower extremity.

Review: Physical fitness training for stroke patients

Comparison: 5 Mixed training versus control - end of intervention

Outcome: 10 Physical function - Fugl-Meyer lower extremity

Study or subgroup	Training N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Fixed,95% CI	Weight	Std. Mean Difference IV,Fixed,95% CI
1 During usual care							
Richards 1993	9	23.7 (6.7)	8	20 (10.7)		8.5 %	0.40 [-0.57, 1.36]
Richards 2004	31	23 (6)	31	23 (7)		31.7 %	0.0 [-0.50, 0.50]
Subtotal (95% CI)	**40**		**39**			**40.2 %**	**0.08 [-0.36, 0.53]**
Heterogeneity: Chi^2 = 0.52, df = 1 (P = 0.47); I^2 =0.0%							
Test for overall effect: Z = 0.37 (P = 0.71)							
2 After usual care							
Duncan 1998	10	26.1 (2.51)	10	22.6 (4.7)		9.1 %	0.89 [-0.04, 1.82]
Duncan 2003	50	2.74 (3.25)	50	1.76 (3.96)		50.7 %	0.27 [-0.13, 0.66]
Subtotal (95% CI)	**60**		**60**			**59.8 %**	**0.36 [0.00, 0.73]**
Heterogeneity: Chi^2 = 1.46, df = 1 (P = 0.23); I^2 =31%							
Test for overall effect: Z = 1.96 (P = 0.050)							
Total (95% CI)	**100**		**99**			**100.0 %**	**0.25 [-0.03, 0.53]**
Heterogeneity: Chi^2 = 2.89, df = 3 (P = 0.41); I^2 =0.0%							
Test for overall effect: Z = 1.75 (P = 0.079)							
Test for subgroup differences: Chi^2 = 0.91, df = 1 (P = 0.34), I^2 =0.0%							

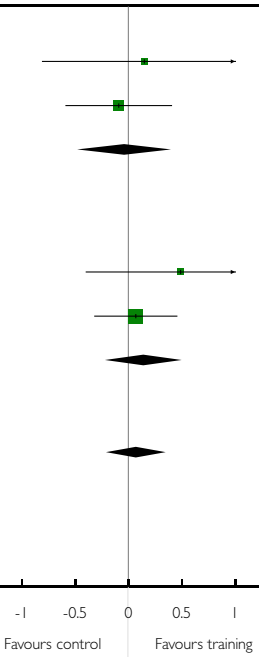
Analysis 5.11. Comparison 5 Mixed training versus control - end of intervention, Outcome 11 Physical function - Fugl-Meyer upper extremity.

Review: Physical fitness training for stroke patients

Comparison: 5 Mixed training versus control - end of intervention

Outcome: 11 Physical function - Fugl-Meyer upper extremity

Study or subgroup	Training N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Fixed,95% CI	Weight	Std. Mean Difference IV,Fixed,95% CI
1 During usual care							
Richards 1993	9	31.7 (21.3)	8	28.1 (25.3)		8.5 %	0.15 [-0.81, 1.10]
Richards 2004	31	30 (20)	31	32 (23)		31.3 %	-0.09 [-0.59, 0.41]
Subtotal (95% CI)	**40**		**39**			**39.8 %**	**-0.04 [-0.48, 0.40]**
Heterogeneity: Chi^2 = 0.19, df = 1 (P = 0.66); I^2 =0.0%							
Test for overall effect: Z = 0.18 (P = 0.86)							
2 After usual care							
Duncan 1998	10	47.6 (17.35)	10	38.6 (17.73)		9.7 %	0.49 [-0.40, 1.38]
Duncan 2003	50	4.48 (5.73)	50	4.04 (6.36)		50.5 %	0.07 [-0.32, 0.46]
Subtotal (95% CI)	**60**		**60**			**60.2 %**	**0.14 [-0.22, 0.50]**
Heterogeneity: Chi^2 = 0.71, df = 1 (P = 0.40); I^2 =0.0%							
Test for overall effect: Z = 0.76 (P = 0.44)							
Total (95% CI)	**100**		**99**			**100.0 %**	**0.07 [-0.21, 0.35]**
Heterogeneity: Chi^2 = 1.29, df = 3 (P = 0.73); I^2 =0.0%							
Test for overall effect: Z = 0.48 (P = 0.63)							
Test for subgroup differences: Chi^2 = 0.39, df = 1 (P = 0.53), I^2 =0.0%							



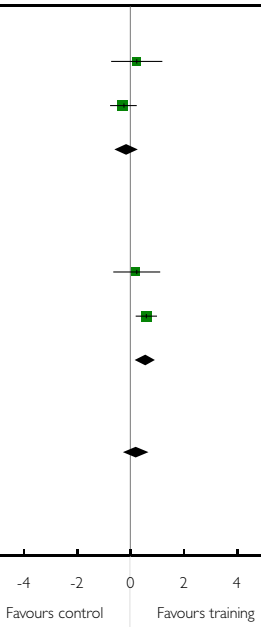
Analysis 5.12. Comparison 5 Mixed training versus control - end of intervention, Outcome 12 Physical function - Berg Balance.

Review: Physical fitness training for stroke patients

Comparison: 5 Mixed training versus control - end of intervention

Outcome: 12 Physical function - Berg Balance

Study or subgroup	Training N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
1 During usual care							
Richards 1993	9	33.2 (18.2)	8	28.4 (19.7)		16.2 %	0.24 [-0.72, 1.20]
Richards 2004	31	45 (7)	31	47 (8)		30.8 %	-0.26 [-0.76, 0.24]
Subtotal (95% CI)	**40**		**39**			**47.0 %**	**-0.15 [-0.60, 0.29]**
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 0.84$, df = 1 (P = 0.36); $I^2 = 0.0\%$							
Test for overall effect: Z = 0.68 (P = 0.49)							
2 After usual care							
Duncan 1998	10	46.9 (3.63)	10	45.8 (5.39)		18.0 %	0.23 [-0.65, 1.11]
Duncan 2003	50	4.36 (5.02)	50	1.7 (3.68)		35.0 %	0.60 [0.20, 1.00]
Subtotal (95% CI)	**60**		**60**			**53.0 %**	**0.54 [0.17, 0.90]**
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 0.56$, df = 1 (P = 0.45); $I^2 = 0.0\%$							
Test for overall effect: Z = 2.88 (P = 0.0040)							
Total (95% CI)	**100**		**99**			**100.0 %**	**0.21 [-0.27, 0.69]**
Heterogeneity: $Tau^2 = 0.13$; $Chi^2 = 6.96$, df = 3 (P = 0.07); $I^2 = 57\%$							
Test for overall effect: Z = 0.86 (P = 0.39)							

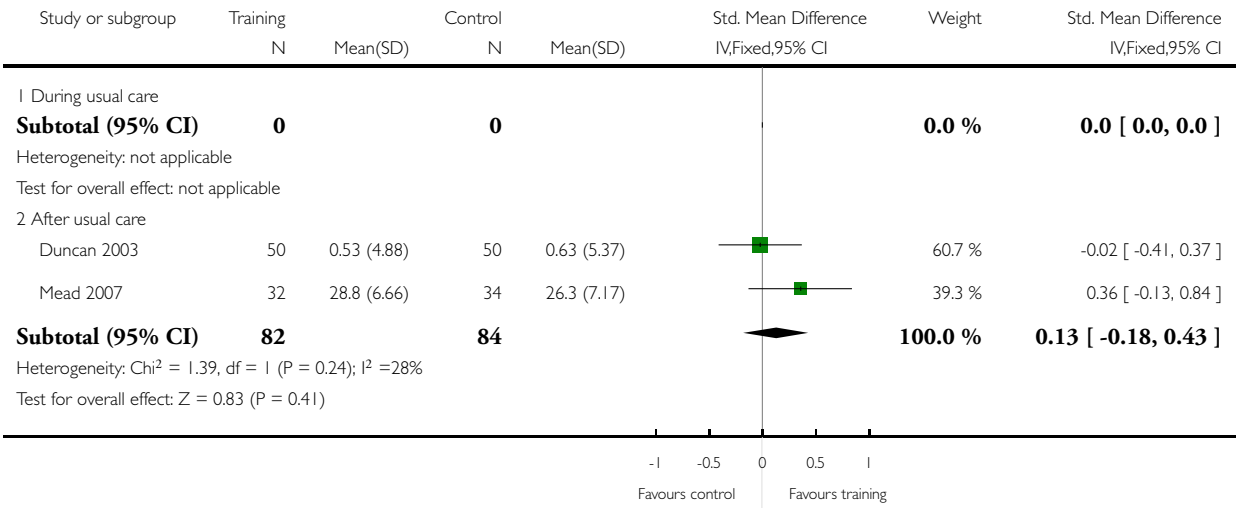


Analysis 5.13. Comparison 5 Mixed training versus control - end of intervention, Outcome 13 Physical function - functional reach.

Review: Physical fitness training for stroke patients

Comparison: 5 Mixed training versus control - end of intervention

Outcome: 13 Physical function - functional reach



Analysis 5.14. Comparison 5 Mixed training versus control - end of intervention, Outcome 14 Physical function - timed up and go (sec).

Review: Physical fitness training for stroke patients

Comparison: 5 Mixed training versus control - end of intervention

Outcome: 14 Physical function - timed up and go (sec)

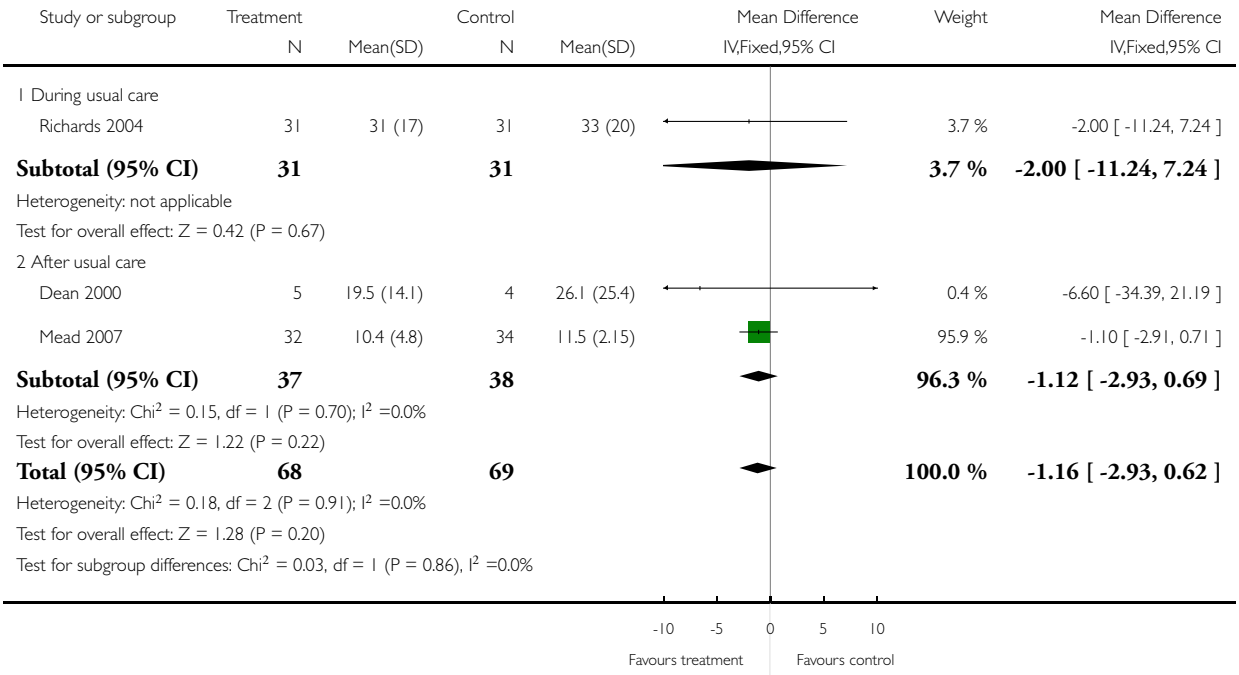
Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 During usual care							
Richards 2004	31	31 (17)	31	33 (20)		1.0 %	-2.00 [-11.24, 7.24]
Subtotal (95% CI)	**31**		**31**			**1.0 %**	**-2.00 [-11.24, 7.24]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.42 (P = 0.67)							
2 After usual care							
Dean 2000	5	19.5 (14.1)	4	26.1 (25.4)		0.1 %	-6.60 [-34.39, 21.19]
Mead 2007	32	10.4 (1.8)	34	11.5 (2.15)		92.8 %	-1.10 [-2.05, -0.15]
Yang 2006	24	12.9 (6.5)	24	14.4 (6.7)		6.1 %	-1.50 [-5.23, 2.23]
Subtotal (95% CI)	**61**		**62**			**99.0 %**	**-1.13 [-2.05, -0.21]**
Heterogeneity: Chi^2 = 0.19, df = 2 (P = 0.91); I^2 =0.0%							
Test for overall effect: Z = 2.40 (P = 0.017)							
Total (95% CI)	**92**		**93**			**100.0 %**	**-1.14 [-2.06, -0.22]**
Heterogeneity: Chi^2 = 0.22, df = 3 (P = 0.97); I^2 =0.0%							
Test for overall effect: Z = 2.43 (P = 0.015)							
Test for subgroup differences: Chi^2 = 0.03, df = 1 (P = 0.85), I^2 =0.0%							

Analysis 5.15. Comparison 5 Mixed training versus control - end of intervention, Outcome 15 Physical function - timed up and go (sec); sensitivity analysis: excluding Yang 2006.

Review: Physical fitness training for stroke patients

Comparison: 5 Mixed training versus control - end of intervention

Outcome: 15 Physical function - timed up and go (sec); sensitivity analysis: excluding Yang 2006



Analysis 5.16. Comparison 5 Mixed training versus control - end of intervention, Outcome 16 Health related QoL - SF-36 role physical.

Review: Physical fitness training for stroke patients

Comparison: 5 Mixed training versus control - end of intervention

Outcome: 16 Health related QoL - SF-36 role physical

Study or subgroup	Training N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Fixed,95% CI	Weight	Std. Mean Difference IV,Fixed,95% CI
1 During usual care							
Subtotal (95% CI)	**0**		**0**			**0.0 %**	**0.0 [0.0, 0.0]**
Heterogeneity: not applicable							
Test for overall effect: not applicable							
2 After usual care							
Duncan 2003	44	44.2 (33.6)	49	27.2 (33.3)		52.9 %	0.50 [0.09, 0.92]
James 2002	10	5.5 (1.64)	9	5.33 (1.5)		11.2 %	0.10 [-0.80, 1.00]
Mead 2007	32	90.8 (14.01)	34	75.5 (22.93)		35.9 %	0.79 [0.29, 1.29]
Subtotal (95% CI)	**86**		**92**			**100.0 %**	**0.56 [0.26, 0.86]**
Heterogeneity: Chi^2 = 1.86, df = 2 (P = 0.39); I^2 =0.0%							
Test for overall effect: Z = 3.66 (P = 0.00025)							
Total (95% CI)	**86**		**92**			**100.0 %**	**0.56 [0.26, 0.86]**
Heterogeneity: Chi^2 = 1.86, df = 2 (P = 0.39); I^2 =0.0%							
Test for overall effect: Z = 3.66 (P = 0.00025)							

Analysis 5.17. Comparison 5 Mixed training versus control - end of intervention, Outcome 17 Health related QoL - SF-36 physical function.

Review: Physical fitness training for stroke patients

Comparison: 5 Mixed training versus control - end of intervention

Outcome: 17 Health related QoL - SF-36 physical function

Study or subgroup	Training N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Fixed,95% CI	Weight	Std. Mean Difference IV,Fixed,95% CI
1 During usual care							
Subtotal (95% CI)	**0**		**0**			**0.0 %**	**0.0 [0.0, 0.0]**
Heterogeneity: not applicable							
Test for overall effect: not applicable							
2 After usual care							
Duncan 2003	44	56 (22.1)	49	43.7 (21.2)		82.5 %	0.56 [0.15, 0.98]
James 2002	10	14.9 (4.43)	9	14.6 (3.67)		17.5 %	0.07 [-0.83, 0.97]
Subtotal (95% CI)	**54**		**58**			**100.0 %**	**0.48 [0.10, 0.85]**
Heterogeneity: Chi^2 = 0.95, df = 1 (P = 0.33); I^2 =0.0%							
Test for overall effect: Z = 2.48 (P = 0.013)							
Total (95% CI)	**54**		**58**			**100.0 %**	**0.48 [0.10, 0.85]**
Heterogeneity: Chi^2 = 0.95, df = 1 (P = 0.33); I^2 =0.0%							
Test for overall effect: Z = 2.48 (P = 0.013)							

Analysis 5.18. Comparison 5 Mixed training versus control - end of intervention, Outcome 18 Health related QoL - SF-36 social function.

Review: Physical fitness training for stroke patients

Comparison: 5 Mixed training versus control - end of intervention

Outcome: 18 Health related QoL - SF-36 social function

Study or subgroup	Training N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
1 During usual care							
Subtotal (95% CI)	**0**		**0**			**0.0 %**	**0.0 [0.0, 0.0]**
Heterogeneity: not applicable							
Test for overall effect: not applicable							
2 After usual care							
James 2002	10	6.2 (3.82)	9	6.22 (2.72)		35.1 %	-0.01 [-0.91, 0.89]
Duncan 2003	44	79.9 (21)	49	62.8 (24.6)		64.9 %	0.74 [0.32, 1.16]
Subtotal (95% CI)	**54**		**58**			**100.0 %**	**0.48 [-0.22, 1.17]**
Heterogeneity: $Tau^2 = 0.15$; $Chi^2 = 2.15$, df = 1 (P = 0.14); $I^2 = 54\%$							
Test for overall effect: Z = 1.34 (P = 0.18)							
Total (95% CI)	**54**		**58**			**100.0 %**	**0.48 [-0.22, 1.17]**
Heterogeneity: $Tau^2 = 0.15$; $Chi^2 = 2.15$, df = 1 (P = 0.14); $I^2 = 54\%$							
Test for overall effect: Z = 1.34 (P = 0.18)							

Analysis 5.19. Comparison 5 Mixed training versus control - end of intervention, Outcome 19 Mobility - Community Ambulation Speed (> 0.8 m/sec).

Review: Physical fitness training for stroke patients

Comparison: 5 Mixed training versus control - end of intervention

Outcome: 19 Mobility - Community Ambulation Speed (> 0.8 m/sec)

Study or subgroup	Treatment n/N	Control n/N	Odds Ratio M-H,Fixed,95% CI	Weight	Odds Ratio M-H,Fixed,95% CI
1 During usual care					
Subtotal (95% CI)	**0**	**0**		**0.0 %**	**0.0 [0.0, 0.0]**
Total events: 0 (Treatment), 0 (Control)					
Heterogeneity: not applicable					
Test for overall effect: not applicable					
2 After usual care					
Duncan 2003	25/50	20/50		57.5 %	1.50 [0.68, 3.31]
Mead 2007	12/32	12/33		42.5 %	1.05 [0.38, 2.88]
Subtotal (95% CI)	**82**	**83**		**100.0 %**	**1.31 [0.70, 2.44]**
Total events: 37 (Treatment), 32 (Control)					
Heterogeneity: Chi^2 = 0.30, df = 1 (P = 0.59); I^2 =0.0%					
Test for overall effect: Z = 0.85 (P = 0.40)					
Total (95% CI)	**82**	**83**		**100.0 %**	**1.31 [0.70, 2.44]**
Total events: 37 (Treatment), 32 (Control)					
Heterogeneity: Chi^2 = 0.30, df = 1 (P = 0.59); I^2 =0.0%					
Test for overall effect: Z = 0.85 (P = 0.40)					

Analysis 6.1. Comparison 6 Mixed training versus control - end of retention follow up, Outcome 1 Disability - Barthel & FIM combined.

Review: Physical fitness training for stroke patients

Comparison: 6 Mixed training versus control - end of retention follow up

Outcome: 1 Disability - Barthel % FIM combined

Study or subgroup	Training N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Fixed,95% CI	Weight	Std. Mean Difference IV,Fixed,95% CI
1 During usual care							
Subtotal (95% CI)	**0**		**0**			**0.0 %**	**0.0 [0.0, 0.0]**
Heterogeneity: not applicable							
Test for overall effect: not applicable							
2 After usual care							
Duncan 2003	40	92.6 (9.5)	40	94.3 (7.8)		54.7 %	-0.19 [-0.63, 0.25]
Mead 2007	32	117.9 (4.3)	34	117.7 (4.3)		45.3 %	0.05 [-0.44, 0.53]
Subtotal (95% CI)	**72**		**74**			**100.0 %**	**-0.09 [-0.41, 0.24]**
Heterogeneity: Chi^2 = 0.52, df = 1 (P = 0.47); I^2 =0.0%							
Test for overall effect: Z = 0.51 (P = 0.61)							

Analysis 6.2. Comparison 6 Mixed training versus control - end of retention follow up, Outcome 2 Mobility - gait preferred speed (m/min).

Review: Physical fitness training for stroke patients

Comparison: 6 Mixed training versus control - end of retention follow up

Outcome: 2 Mobility - gait preferred speed (m/min)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 During usual care							
Richards 1993	31	39 (22.8)	31	42.6 (22.2)		6.4 %	-3.60 [-14.80, 7.60]
Subtotal (95% CI)	**31**		**31**			**6.4 %**	**-3.60 [-14.80, 7.60]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.63 (P = 0.53)							
2 After usual care							
Dean 2000	4	50.4 (28.02)	4	48.9 (28.32)		0.5 %	1.50 [-37.54, 40.54]
Mead 2007	32	41.88 (6.06)	33	44.16 (6)		93.1 %	-2.28 [-5.21, 0.65]
Subtotal (95% CI)	**36**		**37**			**93.6 %**	**-2.26 [-5.18, 0.67]**
Heterogeneity: Chi^2 = 0.04, df = 1 (P = 0.85); I^2 =0.0%							
Test for overall effect: Z = 1.51 (P = 0.13)							
Total (95% CI)	**67**		**68**			**100.0 %**	**-2.34 [-5.17, 0.49]**
Heterogeneity: Chi^2 = 0.09, df = 2 (P = 0.96); I^2 =0.0%							
Test for overall effect: Z = 1.62 (P = 0.10)							
Test for subgroup differences: Chi^2 = 0.05, df = 1 (P = 0.82), I^2 =0.0%							

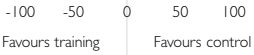
Analysis 6.3. Comparison 6 Mixed training versus control - end of retention follow up, Outcome 3 Physical function - timed up and go (sec).

Review: Physical fitness training for stroke patients

Comparison: 6 Mixed training versus control - end of retention follow up

Outcome: 3 Physical function - timed up and go (sec)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 During usual care							
Richards 2004	31	25 (14)	31	25 (14)		1.5 %	0.0 [-6.97, 6.97]
Subtotal (95% CI)	**31**		**31**			**1.5 %**	**0.0 [-6.97, 6.97]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.0 (P = 1.0)							
2 After usual care							
Dean 2000	4	23.6 (22.9)	4	28.1 (29.5)		0.1 %	-4.50 [-41.10, 32.10]
Mead 2007	32	11.2 (1.66)	34	11.5 (1.86)		98.5 %	-0.30 [-1.15, 0.55]
Subtotal (95% CI)	**36**		**38**			**98.5 %**	**-0.30 [-1.15, 0.55]**
Heterogeneity: Chi^2 = 0.05, df = 1 (P = 0.82); I^2 =0.0%							
Test for overall effect: Z = 0.70 (P = 0.49)							
Total (95% CI)	**67**		**69**			**100.0 %**	**-0.30 [-1.14, 0.55]**
Heterogeneity: Chi^2 = 0.06, df = 2 (P = 0.97); I^2 =0.0%							
Test for overall effect: Z = 0.69 (P = 0.49)							
Test for subgroup differences: Chi^2 = 0.01, df = 1 (P = 0.93), I^2 =0.0%							



Analysis 6.4. Comparison 6 Mixed training versus control - end of retention follow up, Outcome 4 Health related QoL - SF-36 role physical.

Review: Physical fitness training for stroke patients

Comparison: 6 Mixed training versus control - end of retention follow up

Outcome: 4 Health related QoL - SF-36 role physical

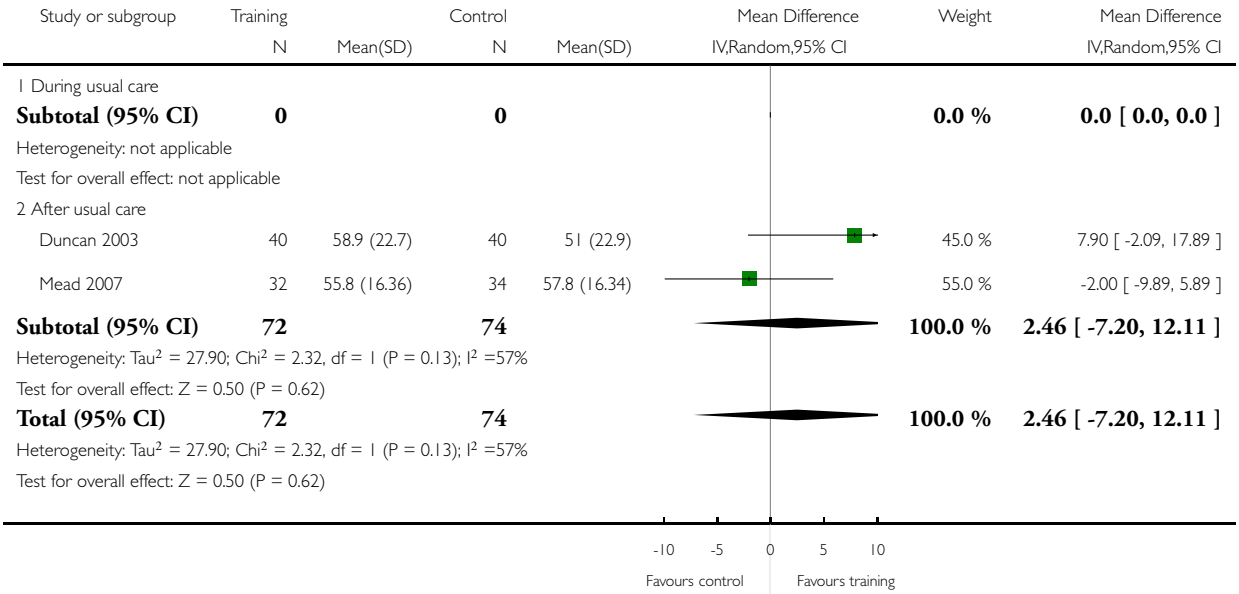
Study or subgroup	Training N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 During usual care							
Subtotal (95% CI)	**0**		**0**			**0.0 %**	**0.0 [0.0, 0.0]**
Heterogeneity: not applicable							
Test for overall effect: not applicable							
2 After usual care							
Duncan 2003	40	50 (37.6)	40	40 (32.9)		35.5 %	10.00 [-5.48, 25.48]
Mead 2007	32	84.2 (20.25)	34	71.7 (27.08)		64.5 %	12.50 [1.01, 23.99]
Subtotal (95% CI)	**72**		**74**			**100.0 %**	**11.61 [2.38, 20.84]**
Heterogeneity: Chi^2 = 0.06, df = 1 (P = 0.80); I^2 =0.0%							
Test for overall effect: Z = 2.47 (P = 0.014)							
Total (95% CI)	**72**		**74**			**100.0 %**	**11.61 [2.38, 20.84]**
Heterogeneity: Chi^2 = 0.06, df = 1 (P = 0.80); I^2 =0.0%							
Test for overall effect: Z = 2.47 (P = 0.014)							

Analysis 6.5. Comparison 6 Mixed training versus control - end of retention follow up, Outcome 5 Health related QoL - SF-36 physical function.

Review: Physical fitness training for stroke patients

Comparison: 6 Mixed training versus control - end of retention follow up

Outcome: 5 Health related QoL - SF-36 physical function



Analysis 6.6. Comparison 6 Mixed training versus control - end of retention follow up, Outcome 6 Case fatality.

Review: Physical fitness training for stroke patients

Comparison: 6 Mixed training versus control - end of retention follow up

Outcome: 6 Case fatality

Study or subgroup	Treatment n/N	Control n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
1 During usual care				
Subtotal (95% CI)	**0**	**0**		**0.0 [0.0, 0.0]**
Total events: 0 (Treatment), 0 (Control)				
Heterogeneity: not applicable				
Test for overall effect: not applicable				
2 After usual care				
Duncan 2003	1/49	2/48		0.48 [0.04, 5.47]
Mead 2007	0/32	0/34		0.0 [0.0, 0.0]
Yang 2006	0/24	0/24		0.0 [0.0, 0.0]
Subtotal (95% CI)	**105**	**106**		**0.48 [0.04, 5.47]**
Total events: 1 (Treatment), 2 (Control)				
Heterogeneity: Chi^2 = 0.0, df = 0 (P = 1.00); I^2 =0.0%				
Test for overall effect: Z = 0.59 (P = 0.55)				
Total (95% CI)	**105**	**106**		**0.48 [0.04, 5.47]**
Total events: 1 (Treatment), 2 (Control)				
Heterogeneity: Chi^2 = 0.0, df = 0 (P = 1.00); I^2 =0.0%				
Test for overall effect: Z = 0.59 (P = 0.55)				

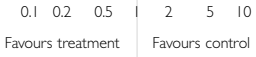
Analysis 6.7. Comparison 6 Mixed training versus control - end of retention follow up, Outcome 7 Mobility - Community Ambulation Speed (> 0.8 m/sec).

Review: Physical fitness training for stroke patients

Comparison: 6 Mixed training versus control - end of retention follow up

Outcome: 7 Mobility - Community Ambulation Speed (> 0.8 m/sec)

Study or subgroup	Treatment n/N	Control n/N	Odds Ratio M-H,Fixed,95% CI	Weight	Odds Ratio M-H,Fixed,95% CI
1 During usual care					
Subtotal (95% CI)	**0**	**0**		**0.0 %**	**0.0 [0.0, 0.0]**
Total events: 0 (Treatment), 0 (Control)					
Heterogeneity: not applicable					
Test for overall effect: not applicable					
2 After usual care					
Duncan 2003	20/50	14/50		48.8 %	1.71 [0.74, 3.96]
Mead 2007	10/32	13/33		51.2 %	0.70 [0.25, 1.94]
Subtotal (95% CI)	**82**	**83**		**100.0 %**	**1.19 [0.63, 2.26]**
Total events: 30 (Treatment), 27 (Control)					
Heterogeneity: Chi^2 = 1.77, df = 1 (P = 0.18); I^2 =43%					
Test for overall effect: Z = 0.55 (P = 0.59)					
Total (95% CI)	**82**	**83**		**100.0 %**	**1.19 [0.63, 2.26]**
Total events: 30 (Treatment), 27 (Control)					
Heterogeneity: Chi^2 = 1.77, df = 1 (P = 0.18); I^2 =43%					
Test for overall effect: Z = 0.55 (P = 0.59)					



Analysis 7.1. Comparison 7 Cardiorespiratory training versus strength training, Outcome 1 Mobility - gait preferred speed (m/min).

Review: Physical fitness training for stroke patients

Comparison: 7 Cardiorespiratory training versus strength training

Outcome: 1 Mobility - gait preferred speed (m/min)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Fixed,95% CI	Weight	Std. Mean Difference IV,Fixed,95% CI
1 Cardiorespiratory training							
Cuviello-Palmer 1988	10	18.11 (9.22)	10	12.07 (6.41)		5.3 %	0.73 [-0.18, 1.64]
Katz-Leurer 2003	46	30.6 (10.8)	44	27 (9.6)		25.3 %	0.35 [-0.07, 0.77]
Pohl 2007	77	26.4 (28.2)	78	19.2 (21.6)		43.9 %	0.29 [-0.03, 0.60]
Salbach 2004	44	46.8 (24)	47	38.4 (22.2)		25.6 %	0.36 [-0.05, 0.78]
Subtotal (95% CI)	**177**		**179**			**100.0 %**	**0.34 [0.13, 0.55]**
Heterogeneity: Chi^2 = 0.82, df = 3 (P = 0.84); I^2 =0.0%							
Test for overall effect: Z = 3.22 (P = 0.0013)							
2 Mixed training							
Dean 2000	5	48.12 (25.68)	4	53.04 (48.9)		2.8 %	-0.12 [-1.43, 1.20]
Duncan 2003	50	10.8 (12.6)	50	6.6 (8.4)		30.4 %	0.39 [-0.01, 0.79]
James 2002	10	12 (1.68)	8	12 (1.68)		5.5 %	0.0 [-0.93, 0.93]
Mead 2007	32	44.1 (6.3)	33	44.1 (6.42)		20.2 %	0.0 [-0.49, 0.49]
Richards 1993	9	18.78 (11.88)	8	13.5 (8.76)		5.1 %	0.48 [-0.49, 1.45]
Richards 2004	31	33 (21)	31	36 (21.6)		19.2 %	-0.14 [-0.64, 0.36]
Teixeira 1999	6	61.8 (24)	7	46.8 (22.2)		3.8 %	0.61 [-0.52, 1.73]
Yang 2006	24	55.5 (8.1)	24	46.62 (9.24)		13.1 %	1.01 [0.40, 1.61]
Subtotal (95% CI)	**167**		**165**			**100.0 %**	**0.27 [0.05, 0.49]**
Heterogeneity: Chi^2 = 10.99, df = 7 (P = 0.14); I^2 =36%							
Test for overall effect: Z = 2.40 (P = 0.017)							
Test for subgroup differences: Chi^2 = 0.25, df = 1 (P = 0.62), I^2 =0.0%							

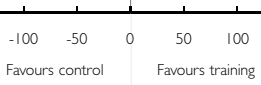
Analysis 7.2. Comparison 7 Cardiorespiratory training versus strength training, Outcome 2 Mobility - gait preferred speed (m/min); sensitivity analysis: confounded studies removed.

Review: Physical fitness training for stroke patients

Comparison: 7 Cardiorespiratory training versus strength training

Outcome: 2 Mobility - gait preferred speed (m/min); sensitivity analysis: confounded studies removed

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 Cardiorespiratory training							
Cuviello-Palmer 1988	10	18.11 (9.22)	10	12.07 (6.41)		43.3 %	6.04 [-0.92, 13.00]
Pohl 2007	77	26.4 (28.2)	78	19.2 (21.6)		33.5 %	7.20 [-0.72, 15.12]
Salbach 2004	44	46.8 (24)	47	38.4 (22.2)		23.2 %	8.40 [-1.12, 17.92]
Subtotal (95% CI)	**131**		**135**			**100.0 %**	**6.98 [2.39, 11.56]**
Heterogeneity: Chi² = 0.16, df = 2 (P = 0.92); I² =0.0%							
Test for overall effect: Z = 2.98 (P = 0.0028)							
2 Mixed training							
Dean 2000	5	48.12 (25.68)	4	53.04 (48.9)		0.3 %	-4.92 [-57.86, 48.02]
Mead 2007	32	44.1 (6.3)	33	44.1 (6.42)		91.9 %	0.0 [-3.09, 3.09]
Richards 2004	31	33 (21)	31	36 (21.6)		7.8 %	-3.00 [-13.60, 7.60]
Subtotal (95% CI)	**68**		**68**			**100.0 %**	**-0.25 [-3.21, 2.71]**
Heterogeneity: Chi² = 0.31, df = 2 (P = 0.85); I² =0.0%							
Test for overall effect: Z = 0.17 (P = 0.87)							
Test for subgroup differences: Chi² = 6.74, df = 1 (P = 0.01), I² =85%							



APPENDICES

Appendix 1. MEDLINE search strategy

Part A: Stroke search strings (Cochrane Stroke Group)

1. cerebrovascular disorders/
2. exp basal ganglia cerebrovascular disease/
3. exp brain ischemia/
4. exp carotid artery diseases/
5. cerebrovascular accident/
6. exp brain infarction/
7. exp cerebrovascular trauma/
8. exp hypoxia-ischemia, brain/
9. exp intracranial arterial diseases/
10. intracranial arteriovenous malformations/

11. exp “Intracranial Embolism and Thrombosis”/
12. exp intracranial hemorrhages/
13. vasospasm, intracranial/
14. vertebral artery dissection/
15. aneurysm, ruptured/
16. brain injuries/
17. brain injury, chronic/
18. exp carotid arteries/
19. endarterectomy, carotid/ or endarterectomy/
20. *heart septal defects, atrial/
21. *atrial fibrillation/
22. (stroke or poststroke or post-stroke or cerebrovasc$ or brain vasc$ or cerebral vasc$ or cva$ or apoplex$ or isch?emi$ attack$ or tia$1 or neurologic$ deficit$ or SAH or AVM).tw.
23. ((brain$ or cerebr$ or cerebell$ or cortical or vertebrobasilar or hemispher$ or intracran$ or intracerebral or infratentorial or supratentorial or MCA or anterior circulation or posterior circulation or basal ganglia) adj10 (isch?emi$ or infarct$ or thrombo$ or emboli$ or occlus$ or hypox$ or vasospasm or obstruction or vasculopathy)).tw.
24. ((lacunar or cortical) adj5 infarct$).tw.
25. ((brain$ or cerebr$ or cerebell$ or intracerebral or intracran$ or parenchymal or intraventricular or infratentorial or supratentorial or basal gangli$ or subarachnoid or putaminal or putamen or posterior fossa) adj10 (haemorrhage$ or hemorrhage$ or haematoma$ or hematoma$ or bleed$)).tw.
26. ((brain or cerebral or intracranial or communicating or giant or basilar or vertebral artery or berry or saccular or ruptured) adj10 aneurysm$).tw.
27. (vertebral artery dissection or cerebral art$ disease$).tw.
28. ((brain or intracranial or basal ganglia or lenticulostriate) adj10 (vascular adj5 (disease$ or disorder or accident or injur$ or trauma$ or insult or event))).tw.
29. ((isch?emic or apoplectic) adj5 (event or events or insult or attack$)).tw.
30. ((cerebral vein or cerebral venous or sinus or sagittal) adj5 thrombo$).tw.
31. (CVDST or CVT).tw.
32. ((intracranial or cerebral art$ or basilar art$ or vertebral art$ or vertebrobasilar or vertebral basilar) adj5 (stenosis or isch?emia or insufficiency or arteriosclero$ or atherosclero$ or occlus$)).tw.
33. ((venous or arteriovenous or brain vasc$) adj5 malformation$).tw.
34. ((brain or cerebral) adj5 (angioma$ or hemangioma$ or haemangioma$)).tw.
35. carotid$.tw.
36. (patent foramen ovale or PFO).tw.
37. ((atrial or atrium or auricular) adj fibrillation).tw.
38. asymptomatic cervical bruit.tw.
39. exp aphasia/ or anomia/ or hemiplegia/ or hemianopsia/ or exp paresis/ or deglutition disorders/ or dysarthria/ or pseudobulbar palsy/ or muscle spasticity/
40. (aphasi$ or apraxi$ or dysphasi$ or dysphagi$ or deglutition disorder$ or swallow$ disorder$ or dysarthri$ or hemipleg$ or hemipar$ or paresis or paretic or hemianop$ or hemineglect or spasticity or anomi$ or dysnomi$ or acquired brain injur$ or hemiball$).tw.
41. ((unilateral or visual or hemispatial or attentional or spatial) adj10 neglect).tw.
42. or/1-41

Part B: Randomised controlled trial search strings (Cochrane Stroke Group)
43. Randomized Controlled Trials/
44. random allocation/
45. Controlled Clinical Trials/
46. control groups/
47. clinical trials/ or clinical trials, phase i/ or clinical trials, phase ii/ or clinical trials, phase iii/ or clinical trials, phase iv/
48. Clinical Trials Data Monitoring Committees/
49. double-blind method/
50. single-blind method/
51. Placebos/

52. placebo effect/
53. cross-over studies/
54. Multicenter Studies/
55. Therapies, Investigational/
56. Drug Evaluation/
57. Research Design/
58. Program Evaluation/
59. evaluation studies/
60. randomized controlled trial.pt.
61. controlled clinical trial.pt.
62. clinical trial.pt.
63. multicenter study.pt.
64. evaluation studies.pt.
65. meta analysis.pt.
66. meta-analysis/
67. random$.tw.
68. (controlled adj5 (trial$ or stud$)).tw.
69. (clinical$ adj5 trial$).tw.
70. ((control or treatment or experiment$ or intervention) adj5 (group$ or subject$ or patient$)).tw.
71. (surgical adj5 group$).tw.
72. (quasi-random$ or quasi random$ or pseudo-random$ or pseudo random$).tw.
73. ((multicenter or multicentre or therapeutic) adj5 (trial$ or stud$)).tw.
74. ((control or experiment$ or conservative) adj5 (treatment or therapy or procedure or manage$)).tw.
75. ((singl$ or doubl$ or tripl$ or trebl$) adj5 (blind$ or mask$)).tw.
76. (coin adj5 (flip or flipped or toss$)).tw.
77. latin square.tw.
78. versus.tw.
79. (cross-over or cross over or crossover).tw.
80. placebo$.tw.
81. sham.tw.
82. (assign$ or alternate or allocat$ or counterbalance$ or multiple baseline).tw.
83. controls.tw.
84. (treatment$ adj6 order).tw.
85. (meta-analy$ or metaanaly$ or meta analy$ or systematic review or systematic overview).tw.
86. or/43-85
87. 42 and 86
88. 87 not exp animals/
89. 87 and humans/
90. 88 or 89

Part C: Physical fitness training search strings

91. exp exercise/
92. exercise test/
93. exp exertion/
94. exercise therapy/
95. physical fitness/
96. exp sports/
97. isometric contraction/
98. isotonic contraction/
99. walking/
100. exp physical endurance/
101. exp locomotion/
102. early ambulation/

103. "sports equipment"/
104. tai ji/
105. yoga/
106. fitness centers/
107. leisure activities/
108. recreation/
109. (physical adj3 (exercise$ or therap$ or conditioning or activit$ or fitness)).tw.
110. (exercise adj3 (train$ or intervention$ or protocol$ or program$ or therap$ or activit$ or regim$)).tw.
111. (fitness adj3 (train$ or intervention$ or protocol$ or program$ or therap$ or activit$ or regim$)).tw.
112. ((training or conditioning) adj3 (intervention$ or protocol$ or program$ or activit$ or regim$)).tw.
113. (sport$ or recreation$ or leisure or cycl$ or bicycl$ or treadmill$ or run$ or swim$ or walk$).tw.
114. ((endurance or aerobic or cardio$) adj3 (fitness or train$ or intervention$ or protocol$ or program$ or therap$ or activit$ or regim$)).tw.
115. (muscle strengthening or progressive resist$).tw.
116. ((weight or strength$ or resistance) adj (train$ or lift$ or exercise$)).tw.
117. ((isometric or isotonic or eccentric or concentric) adj (action$ or contraction$ or exercise$)).tw.
118. or/91-117
119. 90 and 118

WHAT'S NEW

Last assessed as up-to-date: 31 March 2009.

Date	Event	Description
2 March 2009	New search has been performed	We updated the search of the Cochrane Stroke Group Trials Register in March 2009.
3 November 2008	New search has been performed	We updated the searches to March 2007. There are now 24 trials, involving 1147 participants, included in the review; 12 more trials than in the previous version. The text of the review has been revised throughout.
3 November 2008	New citation required and conclusions have changed	There is sufficient evidence to incorporate cardiorespiratory training, using walking as a mode of exercise, into the rehabilitation of patients with stroke in order to improve speed, tolerance and independence during walking, but further trials are needed to determine the optimal exercise prescription after stroke and to establish whether any long-term benefits exist.

HISTORY

Protocol first published: Issue 4, 2001

Review first published: Issue 1, 2004

Date	Event	Description
23 October 2008	Amended	Converted to new review format.

CONTRIBUTIONS OF AUTHORS

DS wrote the protocol, wrote and performed the literature searches, screened the titles and abstracts, applied inclusion criteria and methodological quality assessments; extracted and analysed data and entered this into RevMan; analysed and interpreted data; wrote and entered text into RevMan.

CG wrote the protocol, applied inclusion criteria and methodological quality assessments; extracted and interpreted data; wrote text of the review and provided critical comment on interim drafts of the review.

GM wrote the protocol, applied inclusion criteria and methodological quality assessments; extracted and interpreted data; wrote text of the review and provided critical comment on interim drafts of the review.

AY wrote the protocol, reviewed and provided critical comment on interim drafts of the review.

DECLARATIONS OF INTEREST

GM was the principal applicant, and DS, CG, and AY were co-authors, of the STARTER trial (Mead 2007), which is an included study in this review. This trial was funded by the Chief Scientist Office of the Scottish Government Health Directorates.

AY is married to a director of a company which provides training for those who deliver or supervise exercise for patients, including after stroke.

INDEX TERMS

Medical Subject Headings (MeSH)

*Exercise Therapy; *Physical Fitness; Randomized Controlled Trials as Topic; Resistance Training; Stroke [mortality; *rehabilitation]

MeSH check words

Humans